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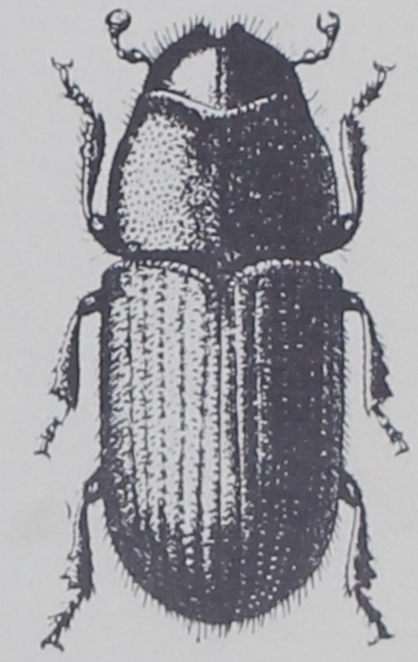
FOREST INSECT CONDITIONS

In the United States / 1961



UNITED STATES DEPARTMENT OF AGRICULTURE / FOREST SERVICE

FOREST INSECT CONDITIONS IN THE UNITED STATES 1961

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

WASHINGTON, D.C. APRIL 1962

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FOREWORD

Summary reports on the status of the more destructive forest insects in the United States are compiled and released annually for the information of persons interested in protecting the forest resources of the Nation against the damage and losses that insects cause. These reports also provide information on the scope of cooperative survey programs of Federal, State, and private agencies; they provide a historic record of occurrences of outbreaks and of fluctuations in pest populations; and, they are a ready source of reference for persons interested in the epidemiology of the pest species. Finally, the reports help generate awareness and interest by owners and managers of public and private forest lands in forest insect problems and in action programs for checking the losses caused by insects.

Beginning in 1960, the summary report on insect conditions was changed in several respects from previous issues. The most significant change was the inclusion of authored sections and reporting on a regional basis. In addition, the format of the authored sections was standardized, illustrations were added, and an index to insects appended. These modifications were for the purpose of improving the accuracy of conditions reported, increasing reader appeal, and improving the overall usefulness of the report. Additional modifications in format and style of the report will be made from time to time to further improve it.

In 1961 there was a noteworthy change in assigned responsibilities within the Forest Service for planning, directing, and conducting forest insect and disease surveys. On July 1, responsibility for this work, previously assigned to Forest Insect and Forest Disease Research Divisions of Forest Service Experiment Stations, was transferred to administrative divisions in the Forest Service Regions and at headquarters offices, Washington, D. C. This transfer of survey responsibilities culminated extensive study of means to intensify insect and disease surveys, facilitate the administration of suppression projects, and strengthen research on insect and disease problems. As a result of this reassignment in responsibilities, entomologists and pathologists who had been handling survey work were transferred from Forest Service Experiment Stations to Forest Service Regional offices. At Forest Service regional headquarters in Juneau, Alaska; Portland, Oreg.; San Francisco, Calif.; Ogden, Utah; Denver, Colo.; and Albuquerque, N. Mex., they were assigned to Divisions of Timber Management. At Missoula, Mont.; Milwaukee, Wis.; Upper Darby, Pa.; and Atlanta, Ga., they were assigned to Divisions of State and Private Forestry. Without exception, the pest control unit responsible for the consolidated survey and control program was centralized at regional headquarters. In regions where travel distances were long and work loads heavy, provision was made for some decentralization of personnel at zone offices. The latter pattern in organization was followed in the three Forest Service Regions east of the Mississippi River.

The forest insect conditions reported by Forest Service entomologists in the sections that follow were obtained by them from aerial and ground surveys, supplemented in varying degree by information from many other sources, including Federal, State, county, and private agencies, and numerous individuals. All this assistance is gratefully acknowledged. Without it, the summary report would be much less complete.

Comments on the content, format, and style of this report are welcome.

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HIGHLIGHTS

As usual, bark beetles were the most important insect pests throughout the United States, and numerous large-scale virulent outbreaks occurred in the Western and Southern States. However, defoliating insects also were important in many sections of the country and outbreaks of some species were reported for the first time in many years. Miscellaneous insect pests, including aphids, scales, weevils, wood borers, shoot and tip moths, spittlebugs, and many others, were troublesome in local areas country-wide. Infestations of regional significance and the scope of action program undertaken for suppression, are highlighted in the paragraphs to follow.

There were explosive increases in populations of some species of bark beetles and resultant tree-killing in outbreak areas was severe. The mountain pine beetle increased at rates up to 10-1 in stands of lodgepole pine in portions of Utah, western Wyoming, and southern Idaho. This resulted in the killing of more than 600,000 trees in 57 infestation centers--the worst epidemic of this important insect at any time during the past 30 years. Smaller outbreaks of the mountain pine beetle also occurred in stands of lodgepole pine at Crater Lake National Park and other locations in Oregon, and in Modoc County, Calif. The beetles were abundant and destructive in stands of western white pine in Idaho, Washington, and parts of Oregon, and they killed sugar pines extensively in the southern Sierra Nevadas, Calif.

The Engelmann spruce beetle was less destructive in 1961 than in the past few years but outbreaks in local areas in Wyoming, Montana, Colorado, and New Mexico killed large numbers of high-value Engelmann spruce. The most serious infestations were on the Bridger National Forest, Wyo., the Grand Mesa-Uncompahgre and Rio Grande National Forests, Colo., and the Carson National Forest and adjacent private lands, N. Mex. With minor exceptions, the outbreaks in all areas were triggered by populations breeding in blow-down timber, cull logs, stumps, and other debris in logging areas.

Deficiencies in precipitation and other factors favored outbreaks of the western pine beetle and ips in stands of ponderosa pine at several locations in the Western States. In central and southern Oregon, especially on the Fremont, Ochoco, Malheur, and Rogue River National Forests, the western pine beetle killed large numbers of trees singly and in groups. For the first time in several years, this species was also abundant on the Nezperce National Forest and the general area extending from Riggens to Kooskia, Idaho. In California, tree-killing by both species was most severe in second-growth stands in the foothill pine belt throughout the central and southern Sierra Nevadas, and at several locations in virgin stands in those areas and in southern California.

The southern pine beetle and the black turpentine beetle are perennial pests in the Southern and Southeastern States. The long-standing outbreak of the former species expanded greatly in the Big Thicket area of southeastern Texas and populations also developed to epidemic levels in portions of Alabama, Mississippi, South Carolina, and Georgia. The black turpentine beetle increased significantly on all lowlands where logging was done by heavy equipment under wet conditions.

The Black Hills beetle continued in outbreak status in stands of ponderosa pine along the Front Range of the Central Rockies, in northern Wyoming, and in the Black Hills of South Dakota. Elsewhere, infestations were less severe than in past years, due largely to sustained efforts to keep populations in check. Suppression in 1962 will be directed largely at outbreaks in Colorado and South Dakota.

There were large acreages of forest stands in all sections of the country severely damaged by several species of defoliating insects. The spruce budworm, occurring in epidemic numbers over large acreages from coast to coast, was the most serious. Some 80,000 acres of balsam fir were heavily defoliated in Maine. Upwards from 1,000,000 acres of spruce-fir stands in Minnesota were infested. In Montana there

was no increase in the $3\frac{1}{2}$ million-acre infestations, but there was a worsening in degree of defoliation. In Idaho, population densities increased sharply in a widespread area and damage to affected Douglas-fir stands was much greater. New outbreaks in southern Colorado, coupled with some spread of older infestations, resulted in a 13 percent increase in area of epidemics. In New Mexico, infestations occurred on more than a million acres, a 33 percent increase over 1960. There were critical infestations on about 50,000 acres in southern Washington. For the country as a whole, close to 10 million acres of fir timber was infested and tree-killing, particularly in the understory, was quite severe in most areas.

The jack-pine budworm defoliated jack pines in varying degree on about 150,000 acres in parts of Michigan, Wisconsin, and Minnesota. The most serious infestations were on approximately 40,000 acres in Wisconsin.

Sudden and severe outbreaks of a pine tussock moth occurred at several places in Minnesota and Wisconsin. Stands of red pine, jack pine, and white spruce were completely defoliated on about 3,500 acres of the General Andrews State Forest, Minn. The pine species suffered severe defoliation at other locations in that State and on some 60,000 acres in Wisconsin. It is predicted that heavier populations will occur in the infested areas in 1962.

After a 10-year absence, the western hemlock looper reappeared in epidemic numbers on about 70,000 acres of hemlock forests of western Oregon. Defoliation ranged from light to heavy and caused some mortality to host trees in localized areas. Heavy populations are predicted in 1962.

The larch casebearer, first discovered in the West during 1957 in the vicinity of St. Maries, Idaho, continued to spread in that State and invaded Montana. In 1961, infestations occurred over a gross area of 9,000 square miles.

Pine needle miner infestations were severe on extensive areas in the West. A species attacking ponderosa pine was damaging on 19,000 acres in the vicinity of Flaming Gorge Dam on the Green River, Utah. Elsewhere in Utah, and in Idaho and Montana, the lodgepole needle miner was in outbreak on some 200,000 acres. The latter species also was damaging to lodgepole pines in California, particularly at Yosemite National Park.

The pandora moth, an important pest of pine forests in the Western States, occurred in epidemic numbers at several locations in 1959. By 1961, most infestations had declined to endemic levels as a result of natural control factors. One outbreak, however, has persisted in the Rocky Mountains and some 36,000 acres of lodgepole pine were defoliated along the Colorado-Wyoming border.

In the tri-State area of Georgia, Tennessee, and North Carolina, oaks, hickories, and other hardwoods were severely defoliated by the elm spanworm. The gross area of infestation was estimated at 1,532,000 acres, a slight decrease from 1960. However, the acreage of moderate to severe defoliation increased and heavy populations in some areas are predicted for 1962. The movement of the outbreak since its discovery several years ago has been in a northerly and easterly direction.

The forest tent caterpillar severely defoliated water tupelo, blackgum, sweetgum, and other bottom land hardwoods over extensive areas in Louisiana and Alabama during the spring. Infestations in both States covered approximately 2.1 million acres. Foliage was completely stripped from trees on more than half of the total area.

Federal and State agencies, and owners and managers of private forest lands made major efforts in 1961 to check the losses caused by insects. The largest single project was directed against the mountain pine beetle epidemics on the Wasatch National Forest, Utah. At that location, every conceivable means was used to kill the beetles in 167,000 trees. Other projects to suppress the mountain pine beetle were also undertaken in other outbreak centers in Utah, western Wyoming, southern Idaho, and eastern Oregon. The scope of suppression to combat outbreaks in 1962 will probably exceed that of the past year.

Several projects were undertaken to suppress the Engelmann spruce beetle in 1961. The largest of these was on the Bridger National Forest, Wyo. However, there were others of major proportions in southern Colorado and northern New Mexico. To the degree possible, suppression of the Engelmann spruce beetle was by salvaging infested trees. Where salvage was not possible, control was attained by trapping the beetles in cull logs and other logging debris, and then destroying them by burning the infested material. In cases where burning was not possible, the infested material

was sprayed with toxic chemicals. Additional control is planned in 1962 to reduce infestations to endemic levels.

The upward trend of infestations and the serious rate of tree-killing by the western pine beetle in Western States prompted renewed suppression efforts. For the most part, suppression was by indirect means, i.e., selective removal from the stand of trees highly susceptible to beetle attack. However, direct control was employed extensively--infested trees were salvaged and many others cut and broods killed by spraying the bark with toxic chemicals. It is anticipated that direct and indirect controls will be used extensively in 1962 to avert new outbreaks and to further suppress those that developed in 1961.

Federal, State, and private agencies combined forces in an all-out effort to suppress outbreaks of the southern pine beetle and the black turpentine beetle in the Southern and Southeastern States. The largest control project was directed against the southern pine beetle in the Big Thicket area in east Texas. In addition, there was prompt and concerted action taken against the new virulent outbreaks in Alabama, Mississippi, and Georgia, and renewed efforts were made to suppress the longstanding infestation in South Carolina. Control of the black turpentine beetle was in infestation centers in logging areas in Louisiana and in naval stores operations in Georgia and Florida. In all cases where possible, infested trees were salvaged. Where salvage for control could not be accomplished, infested trees were sprayed with toxic chemicals and salvaged at a later date. Owners and managers of forested lands were encouraged to avoid using heavy equipment for logging under wet conditions as a means of reducing incidence of black turpentine beetle attack.

The large-scale campaigns to reduce and retard outbreaks of bark beetles forced deferment in suppressing some epidemics of defoliating insects. However, aerial spraying was undertaken against the spruce budworm in Maine and Minnesota; the jack-pine budworm in Wisconsin, the Douglas-fir tussock moth in Idaho; the elm spanworm in Georgia; the Saratoga spittlebug in Michigan and Wisconsin; and the pine reproduction weevil in California. Much larger campaigns are planned to suppress the spruce budworm and other tree defoliators in 1962.

Federal appropriations used to control forest insects on Federal lands, and for the Federal financial share of cooperative projects to suppress outbreaks on non-Federal lands throughout the country in 1961 totaled $3,008,300. A list of the major insect suppression projects, their location, and expenditures for the calendar year 1961 are briefly summarized as follows:

Project	Location	Expenditures
Mountain pine beetle	Rocky Mtns., Pacific States	$1,128,600
Engelmann spruce beetle	Rocky Mountains	557,500
Western pine beetle and ips	Pacific States	463,200
Southern pine beetle	South and Southeast	247,600
Black Hills beetle	Rocky Mtns. and South Dakota	122,300
Black turpentine beetle	South and Southeast	109,400
Spruce budworm	Minnesota and Maine	100,100
Lodgepole needle miner	California	53,800
Elm spanworm	North Carolina, Georgia	35,000
Miscellaneous insects	Countrywide	190,800
Total		$3,008,300

CONDITIONS OF FOREST INSECTS IN FOREST REGIONS
ALASKA

by

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Conditions in Brief

There were no major outbreaks of forest insects in Alaska in 1961. The black-headed budworm was endemic in the coastal hemlock-spruce forests, although an increase in population density is expected in 1962. The hemlock sawfly decreased in numbers and last year's outbreak of cedar bark beetle subsided. Ips beetles were endemic throughout most of the spruce stands of the interior of the State. The Alaska spruce beetle caused serious tree mortality in spruce stands south of the Alaska Range in the coastal zone. An unidentified insect heavily defoliated spruce along the south shore of Cook Inlet. Other unknown species similarly damaged alder on the Chugach National Forest and in the Susitna Valley, and paper birch in the vicinity of Harding Lake near Fairbanks.

Status of Insects

BLACK-HEADED BUDWORM, *Acleris variana* (Fern.). Infestations of black-headed budworm in the hemlock-spruce forests of southeast Alaska were little changed from conditions in 1960. South of Frederick Sound, larval populations were generally light. North of the Sound, however, and at Rodman Bay and Sitkoh Bay on Baranof and Chichagof Islands, respectively, larval populations were heavy. Parasitic enemies of the budworm were relatively scarce in 1961.

There was a marked increase in egg deposition by the adult female moths during the year. Thus, the combination of favorable weather during 1961, low numbers of parasites, and an increase in egg deposition point to a probable increase in the black-headed budworm population in 1962.

HEMLOCK SAWFLY, *Neodiprion tsugae* Midd. The hemlock sawfly occurred only in light numbers in the forested areas of southeast Alaska. Larval counts in sample areas were but 25-33 percent of those occurring in 1960 and eggs were absent in all collections. Extremely light populations are predicted for 1962.

ALASKA SPRUCE BEETLE, *Dendroctonus borealis* Hopk. The Alaska spruce beetle continued to cause serious tree mortality in stands of white spruce south of the Alaska Range. Several local outbreaks occurred in the area between Cook Inlet and the Copper River and tree losses continued high on the Chugach National Forest and the Kenai National Moose Range.

IPS (PINE ENGRAVERS), *Ips* spp. Ips beetles were reported as endemic throughout the spruce stands of Interior Alaska. The recent small outbreak along the Gerstle River, near Fairbanks, subsided from natural causes.

CEDAR BARK BEETLE, *Phloeosinus squamosus* Blkm. The 1960 outbreaks of a cedar bark beetle in scrub stands of Alaska cedar and western redcedar on Kuiu and Kupreanof Islands in southeast Alaska declined.

UNIDENTIFIED DEFOLIATORS. Heavy defoliation of white spruce, similar to damage caused by the spruce budworm, occurred over a large area in the vicinity of Kachemak Bay in Cook Inlet. Almost complete defoliation of alders occurred in high elevations on parts of the Chugach National Forest and along the west side of Susitna Valley. Paper birch at Harding Lake, near Fairbanks, also was heavily defoliated. None of the defoliating insects has yet been identified.

OREGON AND WASHINGTON

by

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Conditions in Brief

Epidemic outbreaks in Oregon and Washington totaled 1,223,230 acres, the lowest recorded during the 11 years for which records are complete.

The spruce budworm outbreaks became critical in southern Washington, but subsided elsewhere in the two States. After a 10-year absence, the western hemlock looper caused serious defoliation in some hemlock stands in northwestern Oregon. Other defoliators occurred in epidemic numbers, but none of the latter will require direct action to suppress them.

The European pine shoot moth was discovered in seven new locations in Washington and Oregon. Known infestations in Spokane, Wash., and Portland, Oreg., were eradicated. Quarantines have been established to prevent further spread of this insect in the Northwest.

An aggressive sanitation-salvage program was begun against the western pine beetle in eastern Oregon. Elsewhere, salvage logging has done much to prevent other serious bark beetle outbreaks.

Immature ponderosa pine stands on the Fremont National Forest, Oreg., were thinned following chemical control to relieve stand pressure and prevent future attacks by the mountain pine beetle.

Maintenance control was carried out against the mountain pine beetle in lodgepole pine stands in Crater Lake National Park, Oreg.

Additional foreign predators of the balsam woolly aphid were imported for a fifth successive year. Some have become established and show signs of controlling bole infestations.

Status of Insects

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). In Oregon, outbreaks in stands of Douglas-fir and true firs on the Fremont National Forest decreased in size and intensity as a result of the action of insect parasites and disease last year. Epidemic infestations in the Blue Mountain region on the Wallowa-Whitman National Forest subsided completely. Infestations on the Yakima Indian Reservation and private lands on the Glenwood District in southern Washington increased considerably in extent and severity in 1961, and higher populations are forecast for 1962.

The 1961 egg mass evaluation survey indicated that the downward trend on the Fremont National Forest will continue, except on one small area. The Yakima Indian Reservation-Glenwood District infestation trend is expected to continue strongly upward. Defoliation in the latter area has reached a critical stage and some top-killing is in progress. Aerial spraying will be necessary in 1962 to protect timber values. Elsewhere in Oregon and Washington suppression is unnecessary.

WESTERN HEMLOCK LOOPER, *Lambdina fiscellaria lugubrosa* (Hulst). After a 10-year absence this serious defoliator of western hemlock reappeared in epidemic numbers in western Oregon. Sizeable areas of light to heavy defoliation occurred in mixed stands of mature and immature western hemlock in the vicinity of Astoria. Some mortality has already occurred in localized areas and other valuable stands are threatened. Unless the overwintering egg population is drastically reduced by natural factors, suppression will be needed in 1962 to protect the affected stands.

PONDEROSA PINE NEEDLE MINER. An outbreak of an unidentified needle miner has been in progress for 4 years on the Warner District of the Fremont National Forest, Oreg. In 1960, the size and intensity of the infestation is potentially important in that the trees may be weakened, making them susceptible to western pine

Snag patches created by an outbreak of the western hemlock looper in western Oregon.

Adult western hemlock looper × 1.8.

beetle attack from surrounding bark beetle infestations. Life history studies are being made so that control measures can be developed, if necessary. Suppression is not needed in 1962.

BLACK-HEADED BUDWORM, *Acleris variana* (Fern.). Sizeable infestations causing light defoliation in Pacific silver fir and western hemlock developed on the Olympic and Snoqualmie National Forests in Washington. The trend of these infestations is undetermined. Most outbreaks of the insect in Oregon and Washington have subsided within a year or two without causing appreciable damage.

WESTERN OAK LOOPER, *Lambdina fiscellaria somniaria* (Hulst). Outbreaks on Oregon white oak near Dallas and Monmouth, Oreg., continued for a second year. Almost complete defoliation occurred early in the summer, but refoliation was noted when larval feeding was finished. In Washington, light to severe defoliation of Oregon white oak was reported near Chehalis and Olympia. Outbreaks of this insect generally subside without causing lasting damage. Hence, control is usually unnecessary under forest conditions.

SPRUCE BUD MOTH, *Zeiraphera ratzeburgiana* Sax. Outbreaks of light to moderate intensity occurred in young Sitka spruce stands at several locations on the west side of the Olympic Peninsula, Wash. Such outbreaks usually subside quickly without causing serious damage to the stands.

LARCH LOOPER, *Semiothisa sexmaculata* (Pack.). An outbreak of this insect occurred in western larch stands on the Colville National Forest, Wash., extending along the south side of the Columbia River from Northport to the Canadian line. The trend of the infestation is being determined. Since western larch can sustain considerable defoliation without being killed, control of this insect is usually unnecessary.

PINE NEEDLE FASCICLE MINER, *Zelleria* sp. One small center of light and moderate infestation of this insect, associated with *"Recurvaria"* sp., increased in size and severity in scattered stands of lodgepole pine south of Olympia, Wash. Only the current growth of lodgepole pine was affected. No control is needed.

EUROPEAN PINE SHOOT MOTH, *Rhyacionia buoliana* (Schiff.). In addition to known infestations in Seattle and Spokane, Wash., and Portland, Oreg., the European pine shoot moth is now found in six counties in Washington where it had not previously been reported: Lewis, Kitsap, Pacific, Skagit, Snohomish, and Whatcom. In Oregon, new infestations were found in Salem, Marion County, and in Clackamas County, as well as in Portland and vicinity. So far, all infestations have been found in nurseries or on ornamental pines. Spread has been by movement of infested nursery stock. Infestations have been found on 15 species or varieties of pines. Mugho pine and Scotch pine are the preferred hosts.

All known infested trees in Spokane, Wash., and in Portland and Salem, Oreg., were destroyed in 1961. These areas will be resurveyed in 1962 and destruction of trees will be done as needed. Intra- and

interstate quarantines have been established to prevent further movement of infested stock. Tests are underway to develop a practical fumigation technique using methyl bromide.

BALSAM WOOLLY APHID, *Chermes piceae* (Ratz.). Balsam woolly aphid infestations in subalpine fir stands increased in size and intensity in Oregon. The largest and most severe outbreaks occurred on the Willamette National Forest. Except in a few local areas, mortality in Pacific silver fir and grand fir was at a very low level. The trend is strongly upward in subalpine fir, but variable in Pacific silver fir and grand fir.

Direct control is impractical under forest conditions. For the past 5 years, efforts to establish colonies of foreign insect predators have been made with some success. Several species have become established and show some promise of reducing aphid populations.

PINE NEEDLE SCALE, *Phenacaspis pinifoliae* (Fitch). This insect caused considerable damage to young ponderosa pine pole stands in and near The Dalles, Oreg. Elsewhere in the pine region of both States, subepidemic losses occurred around orchards. The buildup of these infestations appears to be due to the reduction of predators and parasites by spray drift. The insect is not sufficiently important in Oregon and Washington to warrant suppression.

MOUNTAIN PINE BEETLE, *Dendroctonus monticolae* Hopk. In western white pine stands the largest and most aggressive infestations occurred on the Gifford Pinchot and Wenatchee National Forests and in the Olympic National Park in Washington. In Oregon, increased infestations occurred on the Willamette and Mount Hood National Forests.

In lodgepole pine, outbreaks continued to increase moderately in Oregon forests and decline in Washington forests. The largest increase occurred in Oregon on the Fremont and Winema (former Klamath Indian Reservation) National Forests. Elsewhere, moderate increases were noted. An infestation in Crater Lake National Park increased, but at a reduced rate.

Infestations in stagnated, pole-sized ponderosa pine stands increased slightly in Oregon and Washington. The largest centers of damage occurred on the Wallowa-Whitman National Forest in Oregon.

In general, the trend of the mountain pine beetle infestations is upward in varying degrees for all host species. Control of this insect in western white pine stands has been considered impractical because of the prevalence of blister rust. With the development of successful antibiotics for control of blister rust, control of the mountain pine beetle in this species is being reconsidered. Maintenance control was carried out in several lodgepole pine stands in Crater Lake National Park, Oreg. Thinning of dense ponderosa pine pole stands will relieve stand pressure which is the underlying cause attracting the beetles.

WESTERN PINE BEETLE, *Dendroctonus brevicomis* Lec. Outbreaks of the western pine beetle declined on most areas in Washington and northern Oregon. In central and southern Oregon, however, outbreaks increased, particularly on the Fremont, Ochoco, Malheur, and Rogue River National Forests. The killing of more single trees and small groups of trees in 1961 indicates a possible increase in tree-killing on local areas in 1962.

Control of an outbreak on the Fremont National Forest was begun with the removal of infested trees and through an aggressive sanitation-salvage program. Sanitation-salvage operations are being stepped up at other active centers of infestations on other forests to reduce beetle populations and reduce hazards.

DOUGLAS-FIR BEETLE, *Dendroctonus pseudotsugae* Hopk. Douglas-fir beetle infestations in Washington, especially the recent extensive outbreaks on the Okanogan National Forest and Colville Indian Reservation, subsided. The anticipated flareup of infestation following the extensive blowdown in western Washington in 1958 did not materialize because of a concerted effort to salvage the blowdown and infested trees. The widespread outbreak in southwestern Oregon collapsed. The outbreak on the Umatilla and Wallowa-Whitman National Forests in Oregon remained more or less static. The trend of infestation is variable with locality--up in some areas, down in others. Direct control is not needed in 1962. However, infested trees are being salvaged to reduce the insect populations and utilize the timber before it deteriorates.

FIR ENGRAVER, *Scolytus ventralis* Lec. Infestations of this beetle in grand fir and

subalpine fir stands increased moderately in both States. The largest and most severe centers occurred on the Ochoco, Fremont, and Umatilla National Forests, Oreg. In southern Oregon, a combination of root rot fungi and fir engraver caused some light mortality in Shasta red fir stands. Most of the losses caused by this insect are relatively unimportant because much of the damage occurred in defective, overmature grand fir and subalpine fir stands of low value. The infestation trend is slightly upward. No control is needed in 1962 because most infestations are in small, isolated stands, many of which are in inaccessible areas.

OREGON PINE IPS, *Ips oregonis* (Eichh.). The size and intensity of infestations in young ponderosa pine stands decreased. Subepidemic damage, however, was sustained in most ponderosa pine sapling stands throughout Oregon and Washington. Indications are that Oregon pine ips attacks will be heavier during 1962 in scorched trees around recent burns. Because outbreaks of this insect develop and subside so rapidly, it is better to prevent buildups by management practices rather than to attempt suppression by direct means.

ENGELMANN SPRUCE BEETLE, *Dendroctonus engelmanni* Hopk. Engelmann spruce beetle infestations increased slightly in both States, but remain well below the critical level. The bulk of the damage in Washington occurred along stream bottoms on the Wenatchee National Forest. All of the epidemic outbreaks in Oregon occurred on the Wallowa-Whitman National Forest. All infestations are in isolated stands with little danger of spreading.

DOUGLAS-FIR ENGRAVER, *Scolytus unispinosus* Lec. Outbreaks of this insect occurred in young Douglas-fir stands on dry sites on the Kaniksu and Colville National Forests in Washington. No damage was detected in Oregon. Infestations generally develop during dry years, and return to normal when growing conditions improve.

SILVER FIR BEETLES, *Pseudohylesinus* spp. Epidemic infestations increased slightly in Pacific silver fir stands in both States. However, damage remains well below the levels experienced during the serious 1951-55 outbreak. No direct control measures have been developed against these insects. Salvage of the infested and dead trees is the only practical solution.

CALIFORNIA

by

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Conditions in Brief

Bark beetles were the principal forest insects in California in 1961. The fir engraver killed more timber than any other species and was responsible for the heaviest insect-caused mortality in true firs ever recorded in the State. Combined attacks by the western pine beetle and ips caused serious damage to ponderosa pine in the lower foothill pine belt from El Dorado County south to Kern County. Tree-killing by the Jeffrey pine beetle was spotty, but significant outbreaks occurred in the Jeffrey pine stands of Lassen and Inyo Counties and at several locations in the recreational forests in southern California. The trend of mountain pine beetle infestations was upward in the southern Sierra Nevadas, and heavy tree-killing in mature sugar pines occurred in Yosemite and Sequoia-Kings Canyon National Parks and the Tule Indian Reservation. The lodgepole needle miner was the most important defoliating insect in California and the serious outbreak in the Tuolumne River Basin, Yosemite National Park, continued unabated except in areas subjected to direct control.

Status of Insects

WESTERN PINE BEETLE, *Dendroctonus brevicomis* Lec. Tree-killing by the western pine beetle varied in intensity throughout the State. In the central and southern Sierra Nevadas, losses were heavy in second-growth stands of ponderosa pine, particularly in the foothill pine belt below 5,000 feet elevation. Local outbreaks in virgin ponderosa pines occurred at three locations in northeastern California and at Yosemite and Sequoia-Kings Canyon National Parks. Coulter and ponderosa pines were killed extensively in the recreational forests of southern California. In the latter areas, trees were more vulnerable to attack than elsewhere because of extreme deficiencies in annual precipitation.

IPS (PINE ENGRAVERS) *Ips* spp. These beetles were associated with most of the outbreaks of western pine beetle in the central and southern Sierra Nevadas and in southern California. Attacking alone, they killed large numbers of Coulter and Jeffrey pines in the latter area. The most explosive outbreak occurred at Tanbark, Los Angeles County, in late September and early October. Here, about 25 percent of all the pines surviving the 1960 fire were killed.

JEFFREY PINE BEETLE, *Dendroctonus jeffreyi* Hopk. Infestations of Jeffrey pine beetle in stands of Jeffrey pine were spotty. Significant outbreaks occurred at two locations in northeastern California and in the Lower Deadman area of Inyo County. In southern California, tree-killing was centered around Bear Valley and the Upper Santa Ana drainage, San Bernardino County.

FIR ENGRAVER, *Scolytus ventralis* Lec. The fir engraver killed large numbers of red and white fir at many locations in California; and, the volume of timber destroyed exceeded that caused by any other of the major pest species. Tree mortality was most severe in the Warner Mountains, Modoc County, in Lassen County, and throughout the central and southern Sierra Nevadas.

MOUNTAIN PINE BEETLE, *Dendroctonus monticolae* Hopk. There were no major outbreaks of mountain pine beetles, and tree-killing of significant proportions occurred only at a few locations. A great many lodgepole pines were killed in the Warner Mountains and at Glass Mountain and Medicine Lake, Modoc County. Elsewhere in the State, there was a noticeable reduction

A deck of ponderosa pine logs from trees infested by the western pine beetle, Lassen County, Calif. Salvage of infested trees was a major means used to control bark beetles in California in 1961.

in the rate of loss in lodgepole pine, including Tuolumne Meadows, Yosemite National Park.

The trend of infestations in sugar pine was upward in the southern Sierra Nevada. Group-killing of mature trees occurred at Yosemite and Sequoia-Kings Canyon National Parks, and the Tule Indian Reservation. Group-killing also occurred in second-growth sugar pines at two other locations in Madera and Tulare Counties.

Infestations in ponderosa pine were reported only in Modoc County. At that location, two small outbreaks occurred in second-growth stands.

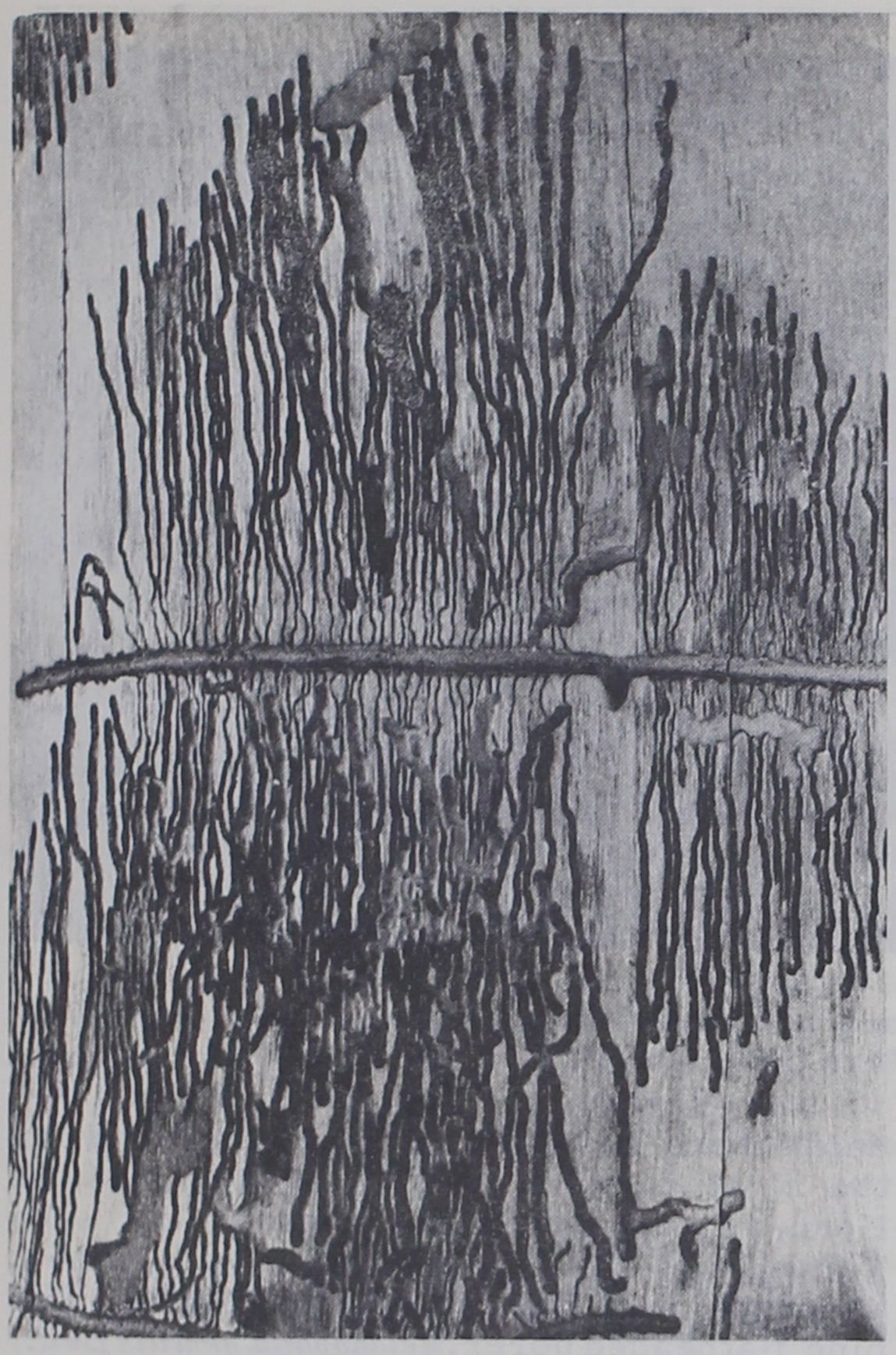
DOUGLAS-FIR BEETLE, *Dendroctonus pseudotsugae* Hopk. No significant infestations of the Douglas-fir beetle were reported. Prompt action in salvaging blowdown timber in Siskiyou County averted possible outbreaks in that area.

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). The longstanding infestation of spruce budworm in stands of white fir in the Warner Mountains, Modoc County, declined. Damage to affected host trees was insignificant.

LARGE ASPEN TORTRIX, *Choristoneura conflictana* (Wlk.). The large aspen tortrix, first recorded in outbreak numbers in aspen stands in Modoc County in 1960, continued at a high level and expanded into adjacent areas. Heavy defoliation of host trees occurred on approximately 3,500 acres.

HORNTAILS, *Sirex* spp. Several species of horntails attacked white and red firs and incense-cedars on several of the 1960 burns in Sierra and Placer Counties. Lumber processed from the attacked trees was severely degraded as a result of the borer damage.

RED TURPENTINE BEETLE, *Dendroctonus valens* Lec. The red turpentine beetle was

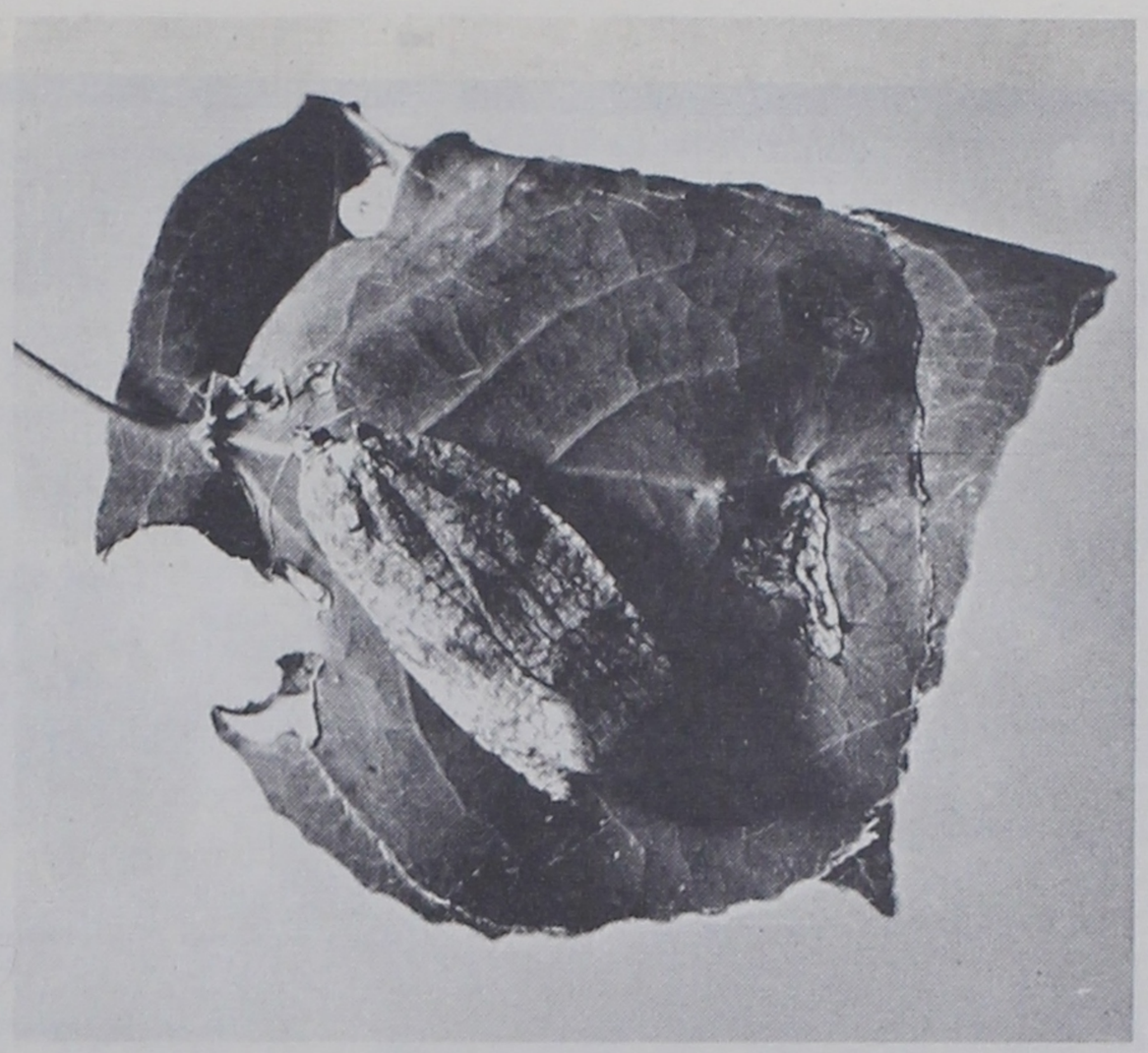


Gallery pattern of the fir engraver, *Scolytus ventralis* Lec. The fir engraver killed a larger volume of timber than any other insect in California in 1961.

particularly abundant statewide. All species of pine were attacked and many otherwise uninfested trees were killed.

CALIFORNIA FLATHEADED BORER, *Melanophila californica* Van Dyke. This insect contributed to the death of ponderosa and Jeffrey pines in many areas throughout the State. In southern California, significant damage was caused to Jeffrey pines.

LODGEPOLE NEEDLE MINER, *"Recurvaria" milleri* Busck. The longstanding outbreaks of this needle miner continued in the lodgepole pine forests in the southern Sierras. The most serious was in the Tuolumne River drainage, Yosemite National Park. However, aerial application of insecticides on approximately 5,000 acres of this infestation during the year greatly reduced populations in the sprayed areas.



The large aspen tortrix, *Choristoneura conflictana* (Wlk.). The first outbreak of the large aspen tortrix in California occurred in 1960 in the South Warner Mountains. The outbreak expended in 1961 and defoliated aspens on several thousand acres.

The outbreaks at Sequoia-Kings Canyon National Park, and near Mineralking, Tulare County, were little changed from 1960. Damage to lodgepole pine by a closely related species continued heavy at Sentinal Meadows, Mono County.

PINE REPRODUCTION WEEVIL, *Cylindrocopturus eatoni* Buch. This pine reproduction weevil was particularly abundant in low-elevation ponderosa pine plantations and in natural reproduction in Tuolumne County. The number of trees killed in natural stands was the highest on record.

ROUNDHEADED FIR BORER, *Tetropium abietis* Fall. The roundheaded fir borer, normally considered a secondary pest of true firs, caused heavy mortality in red fir infected with dwarfmistletoe and *Cytospora* sp. canker. Tree-killing was estimated at 3,000 board feet per acre on about 15,000 acres in the vicinity of Dry Lake, Siskiyou County.

OTHER INSECTS. Seed and cone insects took a heavy toll of the light to moderate seed and cone crop on most commercial coniferous tree species. The very light cone crop on sugar pine was almost completely destroyed by the sugar-pine cone beetle, *Conophthorus lambertianae* Hopk. Two

Larvae of a horntail wasp seriously damaged several million board feet of fire-injured white and red fir in California in 1961.

species of cone moths, *Dioryctria abietella* (D. & S.) and *Barbara colfaxiana* (Kearf.), together with a midge, *Contarinia* sp., caused considerable damage to a light crop of Douglas-fir cones. Seed chalcids, *Megastigmus* spp., and seed maggots, *Earomyia* spp., caused heavy damage to a light crop of cones in white and red fir.

Various species of *Neodiprion* sawflies defoliated young ponderosa pine, white fir, and Douglas-fir at scattered locations. Two defoliators on white fir were recorded for the first time--a weevil, *Agronus cinerarius* Horn, damaging in the vicinity of Lake Tahoe, and an undetermined needle miner, abundant in a part of Modoc County. The pine flatheaded borer, *Melanophila gentilis* Lec., caused scattered local damage to sugar pines in the central Sierra Nevadas, and the flatheaded fir borer, *M. drummondi* (Kirby), caused damage to Douglas-fir on the drier sites in the same general area.

NORTHERN ROCKY MOUNTAIN STATES

by

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Conditions in Brief

Forest insect activity increased in the northern Rocky Mountains in 1961. Spruce budworm defoliation in Montana remained at a high level with an increase in insect populations. The larch casebearer continued its spread in Idaho and invaded Montana. The Douglas-fir tussock moth was epidemic in two areas in Idaho. The mountain pine beetle continued destruction of old-growth western white pine. Ips and western pine beetle outbreaks in ponderosa pine were widespread and were particularly destructive in northern Idaho and central Montana.

Status of Insects

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). Foliar damage by the spruce budworm increased in severity in Douglas-fir stands in the northern half of the outbreak area in Montana. Infested acreage remained at approximately 4-1/2 million acres, and is not expected to increase in size. Budworm egg masses were twice as numerous in 1961 as in 1960--indicative of heavy defoliation in 1962. There was no indication of a decline in the budworm outbreak that has remained epidemic for 14 years.

LARCH CASEBEARER, *Coleophora laricella* (Hbn.). The larch casebearer was first discovered in the West during the summer of 1957 near St. Maries, Idaho. When the discovery was made, at least 15,000 acres of western larch host type showed visible defoliation. When the first comprehensive survey was made in 1958, the casebearer was found established in larch stands over a 4,000-square-mile area. By 1961 the insect had spread to larch stands in an area of 9,000 square miles. Visible damage seen from the air covers 700 square miles.

Larch casebearer larvae in their cases attached to larch twigs. Attempt is being made to control the larch casebearer in Idaho by colonizing parasites in infested stands.

An attempt to establish biological control in Idaho was undertaken in 1960. Shipments of braconid parasites, *Agathis pumilus* (Ratz.), from the Northeastern States were liberated in the infested area. Plans are to intensify biological control in 1962 by liberating larger numbers of parasites and by trying to establish a local source of them for wider distribution.

PINE SAWFLIES, *Neodiprion* spp. An outbreak of two species of sawflies, *Neodiprion nanulus contortae* Ross, and *N. fulviceps* complex, have seriously defoliated 6,000 acres of lodgepole and ponderosa pine in north-central Montana since 1958.

Larval forms collected in 1961 died during rearing, of what was tentatively

determined as polyhedrosis. Later, field examinations indicated that the disease had reduced the larval population. A fall survey showed the overwintering egg population to be very light. The outlook for 1962 is light defoliation in all areas.

DOUGLAS-FIR TUSSOCK MOTH, *Hemerocampa pseudotsugata* McD. Localized outbreaks of this defoliator occurred in Moscow, Clarks Fork, and Bonners Ferry, Idaho. Several species of fir and spruce were infested. Isolated groups of infested trees were found in a 20-square-mile area near Bonners Ferry, mostly in farm woodlots. Some owners sprayed their trees with insecticide to control the pest.

DOUGLAS-FIR NEEDLE MIDGE, *Contarinia* sp. Infestations of this needle midge are a serious problem to the Christmas tree industry in western Montana and northern Idaho. The area infested increased greatly in 1961.

LARCH SAWFLY, *Pristiphora erichsonii* (Hartig). The only active infestation known was in pole-sized stands of western larch in the Olsen Creek drainage, St. Joe National Forest, Idaho. Approximately 1,100 acres were infested.

LARCH BUD MOTH, *Zeiraphera griseana* (Hubner). In 1955-57, the larch bud moth infested an estimated 250,000 acres of western larch in Montana. Later, the outbreaks subsided and no areas of infestation were again observed until 1961. About 500 acres of larch were heavily infested near Tony Peak, Kootenai National Forest, Mont.

GELECHIID MOTH. Two outbreaks of this unidentified moth were recorded in 1961. Defoliation occurred in the terminals of lodgepole pine. In the Gallatin National Forest, Mont., 3,500 acres were infested. Samples of defoliated lodgepole pine were also received from Yellowstone National Park, Wyo.

LODGEPOLE NEEDLE MINER, *"Recurvaria" milleri* Busck. An outbreak of this needle miner was discovered in the Big Belt Mountains, Helena National Forest, Mont. About 4,500 acres of lodgepole pine were infested. Samples of foliage collected in the fall showed very few overwintering larvae.

CALIFORNIA TORTOISE-SHELL, *Nymphalis californica* (Bdv.). Nearly 2,000 acres of Ceanothus were completely defoliated by this insect in the Kaniksu National Forest, Idaho.

PANDORA MOTH, *Coloradia pandora* Blake. Numerous adult pandora moths were collected by light trapping in the Long Pines Division, Custer National Forest, Mont. There was no visible evidence of defoliation.

MOUNTAIN PINE BEETLE, *Dendroctonus monticolae* Hopk. Mountain pine beetle infestations in old-growth western white pine continued to be a problem in northern Idaho and western Montana. A recently completed survey of 41,000 acres of white pine type in the Clearwater National Forest, Idaho, showed the loss of timber from the beetle to be approximately 15.5 million feet board measure in 1960, and 13.2 million feet in 1961. This infestation has persisted for a long period. Data taken in 1938 and compared to the current survey results show that the loss of mature timber has been 40 percent of the stand during the past 24 years.

In Montana, remnants of older infestations of the beetle persist in lodgepole pine at Kintla Lake, and in the Park Creek drainage in Glacier National Park.

DOUGLAS-FIR BEETLE, *Dendroctonus pseudotsugae* Hopk. Periodic outbreaks of the Douglas-fir beetle have probably killed more trees in the northern Rocky Mountains than any other insect. The outbreaks seem to occur at 7- to 9-year intervals. The latest outbreak peak occurred in 1959-60. Currently, beetle activity is at a low point and only three small epidemic infestations occur in the Region.

ENGELMANN SPRUCE BEETLE, *Dendroctonus engelmanni* Hopk. A few outbreak centers of Engelmann spruce beetle occurred in and adjacent to cutover areas in Engelmann spruce stands in Montana. Most of the outbreaks were due to population increases in blowdown trees on the periphery of clear-cut blocks. Cull logs and slash in logged areas may also have produced sufficient brood for green tree attacks. Logging of infested trees for control was continued on the Kaniksu, Kootenai, and Flathead National Forests.

FIR ENGRAVER, *Scolytus ventralis* Lec. The fir engraver is a chronic pest of true firs in the northern Rocky Mountains. In 1961,

Insecticidal sprays were applied to the bark surface of grand fir to control a small outbreak of the fir engraver on the Nezperce National Forest, Idaho.

extensive stands of subalpine fir were killed in Montana; however, most of the damage occurred where the commercial value of killed trees is low.

Early in the season, a small project was undertaken to suppress a fir engraver infestation in a large public campground. In the Clearwater National Forest, Idaho, about 100 infested trees were logged in a management area in an effort to suppress an outbreak. This work is still in progress.

IPS (PINE ENGRAVERS), *Ips* spp. An unusually long activity period in 1961 appeared to favor ips infestations. In the Nezperce National Forest, Idaho, several species, including *I. oregonis* (Eichh.), *I. plastographus* Lec., and *I. interpunctus* (Eichh.), attacked ponderosa pines in groups of varying sizes up to 800 trees. The attacked trees ranged in size from 4 to 12 inches in diameter, breast high.

In Montana, the western six-spined ips, *I. ponderosae* Sw., developing in slash and snow-damaged ponderosa pines, became epidemic. An area of about 130,000 acres in the Crow and northern Cheyenne Indian Reservations was heavily infested. Groups of 100 or more immature trees were killed at many places. Larger trees were also attacked and killed, but in smaller numbers.

WESTERN PINE BEETLE, *Dendroctonus brevicomis* Lec. The western pine beetle was more active in the northern Rocky Mountains than in recent years. Small groups of infested ponderosa pines were common in the Nezperce National Forest, Idaho. Thousands of acres have groups of red-topped trees attacked by the western pine beetles in the lower tree boles and by several species of ips in the tops. The area of infestation extends from Riggins to Kooskia, Idaho.

INTERMOUNTAIN STATES

by

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Conditions in Brief

The coniferous forests of the Intermountain States harbored the most serious epidemics of forest insects that have occurred at any time during the past three decades. The mountain pine beetle was particularly destructive in the lodgepole pine stands of northern Utah, western Wyoming, and southeastern Idaho. The Douglas-fir beetle killed large volumes of Douglas-fir in Utah and Idaho. Populations of the spruce budworm increased sharply and severely defoliated Douglas-fir and true firs in southern Idaho.

The Engelmann spruce beetle was less troublesome than in recent years and outbreaks occurred only at a few locations in Utah and western Wyoming. The fir engraver was active and damaging to true firs in Utah and Idaho. The pinyon pine scale was widespread in stands of pinyon pine in southwestern Utah and southeastern Nevada. There were localized outbreaks of tussock moths, leaf tiers, blotch miners, sawflies, needle miners, tube moths, mealybugs, and tent caterpillars on preferred host trees at many locations in all States.

Status of Insects

MOUNTAIN PINE BEETLE, *Dendroctonus monticolae* Hopk. There was an explosive increase in populations of the mountain pine beetle throughout the lodgepole pine forests in the Intermountain States and more than 600,000 trees were attacked in 57 infestation centers in northern Utah, western Wyoming, and southeastern Idaho.

Large-scale projects to suppress the severe outbreaks were continued or initiated in affected areas during the year. Additional projects will be needed in 1962 to avert wholesale tree-killing over extensive areas. The major control project in 1961 was on the Wasatch National Forest, Utah. Here, some 135,000 infested trees were treated during the spring and summer and 32,000 more were treated in the fall. Approximately 252,000 newly infested trees will require treatment in 1962. Suppression of infestations was also undertaken on the Ashley National Forest, Utah; the Teton National Forest and Grand Teton National Park, Wyo.; and the Targhee, Cache, and Sawtooth National Forests, Idaho.

Several methods were used in efforts to suppress the epidemics in affected areas. Wherever possible, infested trees were salvaged. However, poor market conditions for lodgepole pine hampered logging for control. In one area on the Wasatch National Forest, where more than half of the lodgepole pine stand was infested, trees were uprooted by tractors and piled and burned. In other areas in Utah, Wyoming, and Idaho, infested trees were burned standing or sprayed, standing or felled, with toxic chemicals. In some cases, infested trees were felled, decked, and burned.

Infestations of mountain pine beetle in ponderosa pine occurred in second-growth stands at two locations. One was in the vicinity of McCall, Idaho; the other was at Crystal Bay on the northern shore of Lake Tahoe, Nev. There was no direct control in either area.

ENGELMANN SPRUCE BEETLE, *Dendroctonus engelmanni* Hopk. Infestations of Engelmann spruce beetle were less numerous and less severe in the Intermountain States than for the past several years. Small outbreak centers occurred, however, on the Dixie and Manti-La Sal National Forests, Utah; the Boise National Forest, Idaho; and the Bridger National Forest, Wyo. The largest of these outbreaks, on the Green River District, Bridger National Forest, was materially reduced by direct control in 1961. The infested trees remaining in this area are to be logged, and followup treatment during the summer months should reduce infestations to endemic levels.

Severe epidemics of mountain pine beetle threaten lodgepole pine stands throughout northern Utah, western Wyoming, and southeastern Idaho. This infestation is on the Wasatch National Forest, Idaho.

Suppression of the mountain pine beetle in severely affected stands of lodgepole pine, Wasatch National Forest, Utah, required the uprooting of trees with tractors. Infested trees were later burned.

Broods of mountain pine beetle in lodgepole pine were destroyed by burning trees standing in suppressing epidemics on Wasatch National Forest, Utah.

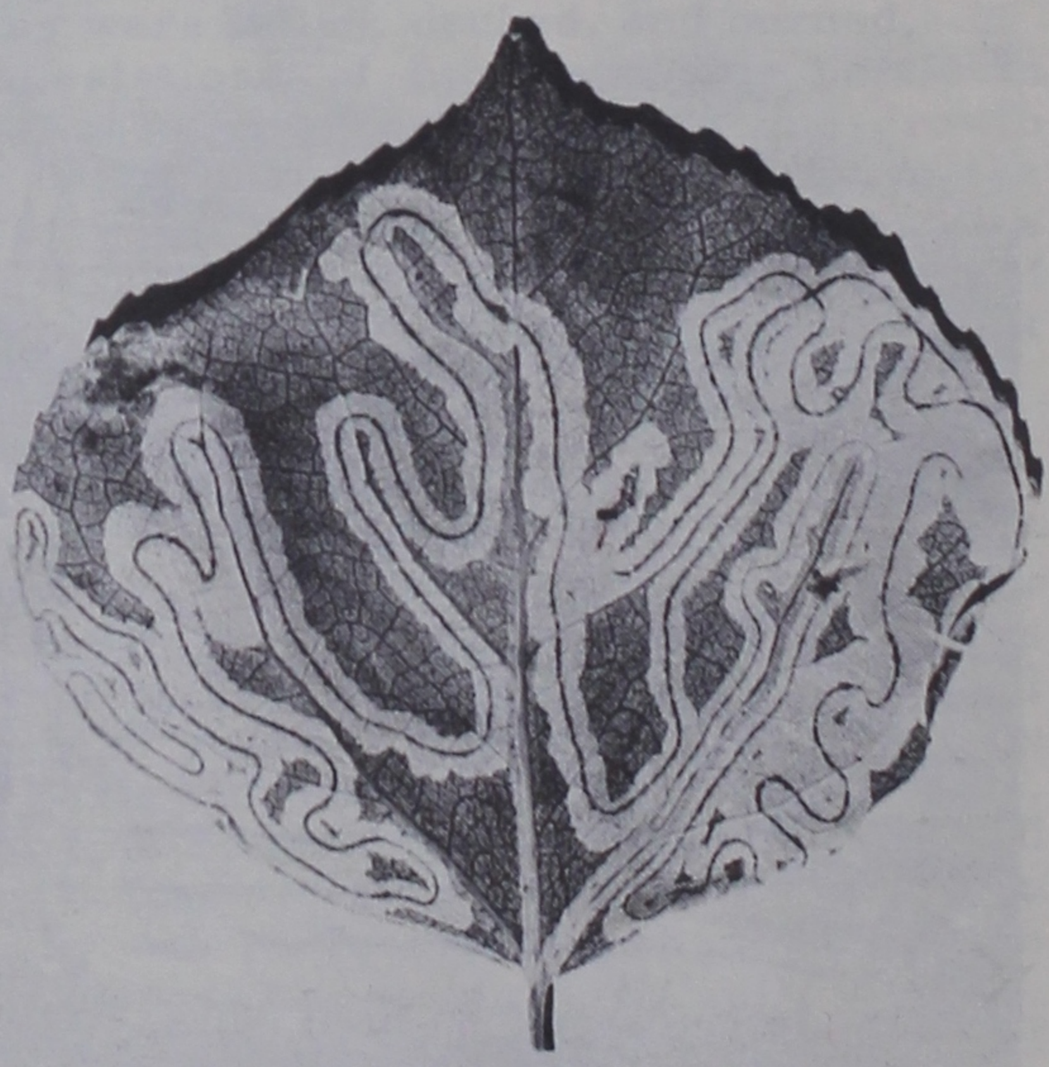
BLACK HILLS BEETLE, *Dendroctonus ponderosae* Hopk. Populations of the Black Hills beetle in stands of ponderosa pine in southern Utah have shown a definite downward trend for the past several years. This trend continued in 1961.

DOUGLAS-FIR BEETLE, *Dendroctonus pseudotsugae* Hopk. The Douglas-fir beetle was abundant throughout south Idaho, western Wyoming, and Utah. Douglas-fir stands on the Sawtooth National Forest, Idaho, and on the Dixie National Forest, Utah, were particularly hard hit. Tree-killing in these areas is expected to continue at the same high level in 1962. Logging infested trees is the only practical means of control and this effort is hampered by lack of access to the affected stands.

FIR ENGRAVER, *Scolytus ventralis* Lec., and WESTERN BALSAM BARK BEETLE, *Dryocoetes confusus* Sw. These two bark beetles kill many thousands of true firs each year throughout the Intermountain States. The majority of the affected stands are in rather inaccessible areas and have relatively low economic value. Thus, control of infestations is rarely undertaken, except in high value recreational areas.

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). A widespread increase in scope and severity of spruce budworm infestations occurred in southern Idaho during 1961. The 1.4 million acres of Douglas-fir and true fir infested represents a 275 percent increase in acreage affected over 1960. Damage levels in 1961 also were much higher than in 1960, with 800,000 acres sustaining medium or heavy defoliation. The increasing trend of spruce budworm infestations is expected to continue unless populations are reduced by direct means.

ASPEN LEAF MINER, *Phyllocnistis populiella* Chamb. Populations of this leaf miner, which have been reported in western Wyoming and eastern Idaho for the past 10 to 13 years, continued to inflict extensive damage to aspen stands in 1961. Tree mortality as a result of defoliation became increasingly evident. No effort was made to reduce populations by direct means.



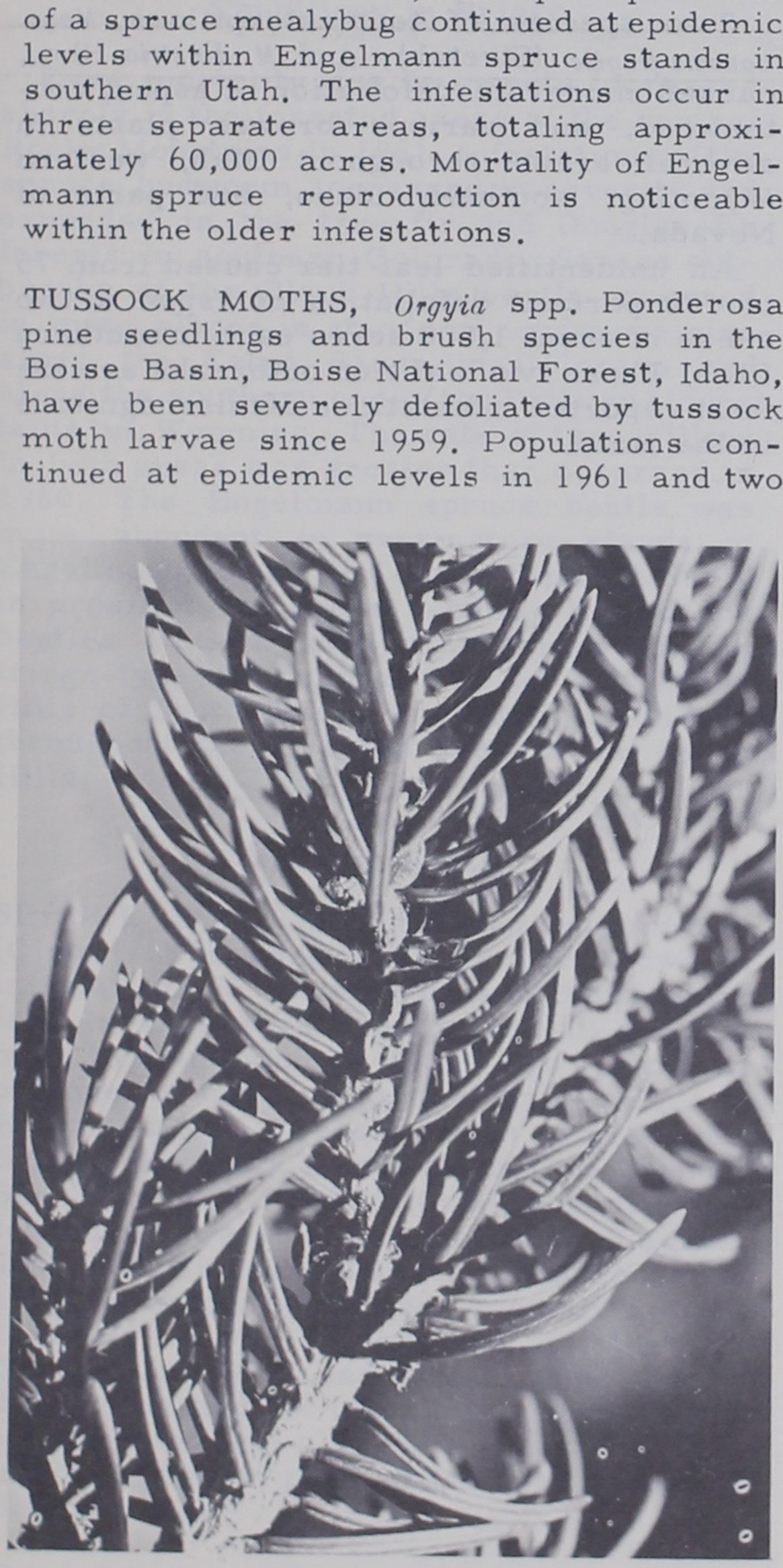
Aspen leaf miner, *Phyllocnistis populiella* Chamb., severely damaged aspen in western Wyoming and eastern Idaho.

WHITE-FIR NEEDLE MINER, *Epinotia meritana* Hein. A serious outbreak of this needle miner in stands of white fir in southern Utah was suppressed in 1957 by aerial application of malathion. Heavy parasitism of the needle miner population at that time, within and without areas sprayed, also helped to suppress the outbreak. In 1960, an increase in needle miner population was observed in areas previously infested. The upward trend continued in 1961.

SPRUCE MEALYBUG, *Puto* sp. Populations of a spruce mealybug continued at epidemic levels within Engelmann spruce stands in southern Utah. The infestations occur in three separate areas, totaling approximately 60,000 acres. Mortality of Engelmann spruce reproduction is noticeable within the older infestations.

TUSSOCK MOTHS, *Orgyia* spp. Ponderosa pine seedlings and brush species in the Boise Basin, Boise National Forest, Idaho, have been severely defoliated by tussock moth larvae since 1959. Populations continued at epidemic levels in 1961 and two plantations, Town Creek and Clay Creek, required spraying to save the valuable ponderosa pine seedlings.

The tussock moth infestation in stands of white fir at Wheeler Peak, Nev., was endemic. Populations in this area were reduced materially in 1960 by aerial application of a polyhedral virus.



Adult female spruce mealybugs, *Puto* sp., on foliage of Engelmann spruce, Dixie National Forest, Utah (×1.5).

PONDEROSA PINE NEEDLE MINER, *"Recurvaria" moreoneilla* Hein. A severe infestation of this needle miner in ponderosa pine stands occurred on some 19,000 acres of the Ashley National Forest, Utah. The infestation centers in the newly developed forest recreation area in the vicinity of the Flaming Gorge Dam on the Green River. The needle miner infested only needles more than three years old. Thus, trees were only partly defoliated. It was estimated that more than 80 percent of the stand was attacked.

LODGEPOLE NEEDLE MINER, *"Recurvaria" milleri* Busck. Infestations of the lodgepole needle miner have increased in severity in the lodgepole pine forests of the Intermountain States since 1957. In 1961 some 200,000 acres were infested in varying degree. Epidemic centers occurred at several locations in the Targhee and Caribou National Forests, Idaho; the Bridger National Forest, Wyo.; and the Ashley National Forest, Utah.

TUBE MOTH, *Argrotaenia* sp. A tube moth, tentatively determined as *A. pinatubana* Kearf., was found infesting approximately 100,000 acres of lodgepole pine near St. Anthony, Idaho. The infestation was most severe in reproduction and young trees on cutover areas. No control was undertaken and none may be needed. However, the infestation could cause widespread deformity of lodgepole reproduction, which in turn would impair the value of future saw logs in the area.

PINYON PINE SAWFLY, *Neodiprion edulicolus* Ross. An outbreak of this sawfly has persisted in stands of pinyon pine near Pioche, Nev., for the past several years. During 1960, unseasonable snowstorms and low temperatures, combined with increased numbers of sawfly parasites, reduced the population to a relatively low level. In 1961, sawfly populations increased and affected trees were lightly defoliated. No effort was made to suppress populations by direct means, and usually none is needed because

affected stands are of low value. However, sawfly defoliation seriously curtails the harvest of pinyon pines from the area for use as Christmas trees.

LARCH SAWFLY, *Pristiphora erichsonii* (Hartig). Epidemic numbers of larch sawfly larvae severely defoliated larch stands near McCall, Idaho. Pupal density in the outbreak area was high. However, laboratory rearings showed a high percentage of them were parasitized, thus the surviving population may be insufficient to cause noticeable defoliation in 1962.

PANDORA MOTH, *Coloradia pandora* Blake. The expected damage to stands of lodgepole pine in northern Utah infested by pandora moth failed to materialize in 1961. The larval population in all infested areas declined, primarily as a result of infection by a native polyhedral virus.

PINYON NEEDLE SCALE, *Matsucoccus acalyptus* Herbert. Several hundred thousand acres of pinyon pine in southwestern Utah and southeastern Nevada, heavily infested by this scale insect, suffered severe defoliation in 1961. The infestation is expected to persist and to further defoliate affected trees.

OTHER INSECTS. A leaf blotch miner, tentatively identified as *Phyllonorycter tremuloidiella* (Braun), was abundant on aspens and cottonwoods in and around Zion National Park, Utah. An average of about 10 percent of the foliage was destroyed on trees that were affected.

Two species of tent caterpillars, *Malacosoma fragile* (Stretch), and *M. disstria* Hbn., caused moderate defoliation of aspen, cottonwood, and various browse plants in several areas throughout Utah, western Wyoming, southern Idaho, and parts of Nevada.

An unidentified leaf tier caused from 75 to 100 percent defoliation of aspen in two areas of about 1,000 acres each in southern Utah. These two leaf tier outbreaks are the first reported infestations of this magnitude in the State.

CENTRAL ROCKY MOUNTAINS

by

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Conditions in Brief

Tree mortality due to insects increased sharply in the forested areas of the central Rocky Mountains in 1961. Infestations of the spruce budworm increased in severity and expanded in the true fir and Douglas-fir forests in southern Colorado. Severe outbreaks of the Black Hills beetle occurred in many places in stands of ponderosa pine along the Front Range in Colorado and along the southern end of the Bighorn Mountains in Wyoming. The rate of tree-killing in both areas was greater than occurred in 1960. The Engelmann spruce beetle was quite abundant in overmature stands of Engelmann spruce in Colorado, particularly in proximity to areas recently logged. Ips beetles caused considerable mortality in fringe-type ponderosa pine in the Black Hills of South Dakota and some top-killing throughout the forested area in the Black Hills.

Status of Insects

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). The acreage of spruce budworm infestations in the true fir and Douglas-fir forests in Colorado increased 13 percent over that infested in 1960. New outbreaks discovered on the Arapaho, Roosevelt, and Routt National Forests, when coupled with those previously known on the Rio Grande, San Juan, and Pike National Forests, extended over a total area of 589,200 acres. The severity of defoliation also increased in 1961, causing heavy tree mortality, particularly in the understory, on the Rio Grande, San Juan, and Pike Forests. Heavy defoliation and an increase in tree-killing is predicted for all infested areas in 1962 unless budworm populations are reduced by direct means.

BLACK HILLS BEETLE, *Dendroctonus ponderosae* Hopk. The Black Hills beetle continued in outbreak status in ponderosa pine along the Front Range of the central Rocky Mountains. In comparison to 1960, there was a threefold increase in number of trees killed. The most serious outbreaks occurred on parts of the Pike and Roosevelt National Forests, and adjacent private lands, Colo. Others, of lesser magnitude, occurred on parts of the Bighorn National Forest and adjacent lands, Wyo., and the Black Hills National Forest, S. Dak. It is estimated that 53,000 infested trees will need to be treated in all affected stands by July 1962 to reduce outbreak populations to endemic levels.

ENGELMANN SPRUCE BEETLE, *Dendroctonus engelmanni* Hopk. The Engelmann spruce beetle was abundant in the mature and overmature stands of Engelmann spruce in Colorado, particularly in areas adjacent to recent cuttings. Two new outbreaks, both adjacent to logged areas, were discovered in 1961; one, on the Alpine Plateau, Grand Mesa-Uncompahgre National Forest, killed approximately 14,500 trees; the second, at West Crow Creek, Rio Grande National Forest, killed about 8,000 trees.

The outbreaks reported in 1960 on the San Juan National Forest were suppressed by trapping the newly emerged beetles in felled green spruce trees. A total of 16,000 spruce trees were felled in the trapping-for-control program, all of which were later salvaged.

OREGON PINE IPS, *Ips oregonis* (Eichh.). A deficiency of precipitation in western South Dakota favored a buildup of the Oregon pine ips and large numbers of ponderosa pines were killed and many others top-killed along the south and west edges of the Black Hills. Many of the killed trees were later infested by the Black Hills beetle.

MOUNTAIN PINE BEETLE, *Dendroctonus monticolae* Hopk. Mountain pine beetle infestations in stands of lodgepole and limber pine on parts of the Shoshone National Forest,

After cull logs and other debris from logging in stands of Engelmann spruce in Colorado are attacked by Engelmann spruce beetle, all such material is windrowed by tractor and burned to destroy the beetle broods.

Wyo., were much reduced from conditions reported there in 1960. There was one small outbreak, however, northwest of Dubois, Wyo., where an estimated 1,200 lodgepole pines were killed.

DOUGLAS-FIR TUSSOCK MOTH, *Hemerocampa pseudotsugata* McD. Small localized infestations of the Douglas-fir tussock moth occur on occasion west and south of Denver, Colo. One such infestation occurred in 1961 and Colorado blue spruce trees, planted in the area as ornamentals, were severely defoliated. The tops of the infested trees were killed.

PANDORA MOTH, *Coloradia pandora* Blake. First year larvae of the pandora moth were numerous in stands of lodgepole pine along the Colorado-Wyoming border. Defoliation of host trees was light, but heavy enough to be visible from low-flying aircraft. On the basis of aerial observations, it was estimated that 36,000 acres of host type were defoliated. Infestation spread has been northeastward within the Medicine Bow National Forest, Wyo.

GREAT BASIN TENT CATERPILLAR, *Malacosoma fragile* (Stretch). It is noteworthy that infestations of this defoliator in stands of aspen in southern Colorado continued a downward trend in 1961. Infested patches of aspen were found only at scattered locations on the Gunnison and San Juan National Forests.

WESTERN BALSAM BARK BEETLE, *Dryocoetes confusus* Sw. Infestations of this bark beetle in subalpine fir stands in Colorado were little changed from conditions in 1960. In some locations, there was an increase in the rate of tree-killing. However, the trend was downward in most areas.

DOUGLAS-FIR BEETLE, *Dendroctonus pseudotsugae* Hopk. Low endemic infestations of the Douglas-fir beetle prevailed in all stands of Douglas-fir in the central Rocky Mountains.

OTHER INSECTS. An unidentified pine needle miner caused light defoliation on several thousand acres of ponderosa pine in southern Colorado. Infestations were most noticeable on the San Juan and San Isabel National Forests, and on private lands west of Colorado Springs.

An unidentified pine sawfly lightly defoliated approximately 400 acres of young lodgepole pines in the vicinity of Grand Lake, Colo. The infestation is expected to subside, however, because heavy wet snows in early September killed many of the larvae.

SOUTHWESTERN STATES[1]

by

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Albuquerque, New Mexico

Conditions in Brief

Destructive populations of several species of insects caused severe tree-damage and tree-killing in the Southwestern States. The Engelmann spruce beetle continued to devastate mature spruce stands in northern New Mexico. Douglas-fir beetle attacks were static at a high level throughout Arizona and New Mexico. The Arizona five-spined ips and the roundheaded pine beetle caused a limited amount of damage to ponderosa pine. Several projects were undertaken to suppress outbreak populations.

Infestations of the spruce budworm increased in size and intensity throughout the mixed conifer forest in northern New Mexico. The pinyon needle scale was a serious problem on pinyon trees in National Parks and Monuments in the southern Rocky Mountains. Defoliation of broadleaf trees by the fall webworm increased in recreation areas throughout New Mexico and Arizona. There were no large-scale projects undertaken to suppress defoliating insects.

Status of Insects

ENGELMANN SPRUCE BEETLE, *Dendroctonus engelmanni* Hopk. Two serious Engelmann spruce beetle outbreaks developed in mature spruce stands in northern New Mexico during the past several years. Both outbreaks originated in logging debris in adjacent areas.

The outbreak on the Tierra Amarilla Grant near Chama, N. Mex., exploded in 1961 and killed 50 percent or more of the spruce on 8,000 acres. The 10,000-acre outbreak on the Rio Grande Grant (now part of the Carson National Forest) and adjacent Carson National Forest near Taos, N. Mex., remained static. An estimated 95,560 attacks in 1960 and 81,680 in 1961 occurred on about 3,500 acres. Suppression of the latter outbreak by logging infested stems and piling and burning infested cull material is in progress.

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). The spruce budworm outbreaks in mixed conifer forests in northern New Mexico encompassed over a million acres in 1961--an increase of about 350,000 acres over last year. Most of this increase was on private land east of Eagle Nest, N. Mex. Infestation intensity increased in most areas, except on the western division of the Santa Fe National Forest where a decline was noted. The 1961 egg mass survey indicated that the downward trend in the western division of the Santa Fe National Forest will continue, but infestations in all other areas will remain static or increase slightly. In these areas, tree-killing, especially of the understory, and top-killing will increase because of the accumulated effect yearly budworm feeding has on its host.

DOUGLAS-FIR BEETLE, *Dendroctonus pseudotsugae* Hopk. Tree-killing by this insect continued at a high level throughout the Douglas-fir stands in Arizona and New Mexico. Salvage logging for control is being done in accessible areas.

ARIZONA FIVE-SPINED IPS, *Ips lecontei* Sw. Infestations of the Arizona five-spined ips declined slightly in standing ponderosa pines on the Prescott National Forest, Ariz. A fall examination on the forest revealed that the population of this ips was extremely high in logging slash and this could lead to renewed tree-killing.

CALIFORNIA FIVE-SPINED IPS, *Ips confusus* (Lec.). The infestation of California five-spined ips declined in stands of pinyon pine

[1]Includes forested lands in Arizona and New Mexico and National Park Service land in southern Colorado and west Texas.

One-year-old logging debris used to trap Engelmann spruce beetle is piled mechanically for burning in suppressing outbreaks on the Carson National Forest, N. Mex.

adjacent to Walnut Canyon National Monument, Ariz. However, the beetle population remained above normal, posing a threat to the monument in 1962. This outbreak originated in pinyon pine cabled for range improvement. The beetles multiplied in the debris, then attacked and killed standing trees.

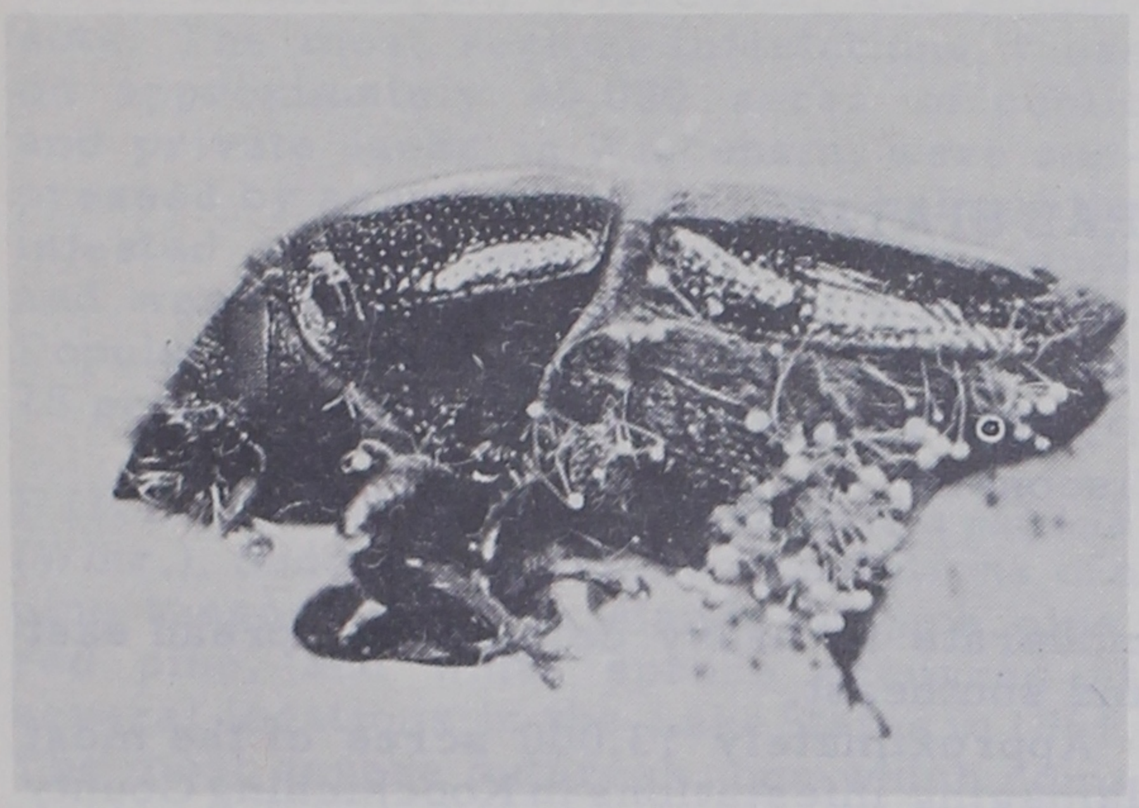
BLACK HILLS BEETLE, *Dendroctonus ponderosae* Hopk. A small infestation of this beetle killed limber pine on a portion of the Cibola National Forest, N. Mex. The persistent infestation in ponderosa pine on the Tres Piedras District, Carson National Forest, N. Mex., declined and became so scattered that direct control will not be needed in 1962.

ROUNDHEADED PINE BEETLE, *Dendroctonus convexifrons* Hopk. An infestation of this bark beetle in ponderosa pine appeared around Bonito Lake, Lincoln National Forest, a vital source of water for the city of Alamogordo, N. Mex. Approximately 700 trees were sprayed with ethylene dibromide in August and 1,500 more trees will need to be treated in 1962 to suppress the outbreak.

FIR ENGRAVER, *Scolytus ventralis* Lec. The 3-year-old fir engraver outbreak in white fir on the Lincoln National Forest, N. Mex., and adjoining Mescalero Indian Reservation ended abruptly. The 11-year-old outbreak in the Sandia Mountains, Albuquerque, N. Mex., continued to decline but tree-killing is still severe on 5,000 acres. A parasitic fungus of the fir engraver, *Aspergillus parasiticus* Speare, may have caused the decline. Three other infestations of this engraver, approximately 600 acres each, two in Arizona, the other in New Mexico, remained static.

WESTERN BALSAM BARK BEETLE, *Dryocoetes confusus* Sw. This insect continued to take a high toll of corkbark and subalpine firs in northern New Mexico. Tree mortality was particularly severe on 40,000 acres near Red River, Carson National Forest.

DOUGLAS-FIR TUSSOCK MOTH, *Hemerocampa pseudotsugata* McD. Outbreak proportions of the Douglas-fir tussock moth continued in white fir and Douglas-fir in several box canyons on Sandia Mountain near Albuquerque, N. Mex. The area is in-



A parasitic fungus may be one of the natural control factors responsible for the decline of the fir engraver infestations on Sandia Mountain near Albuquerque, N. Mex.

accessible to aerial spraying, thus no effort was made in control.

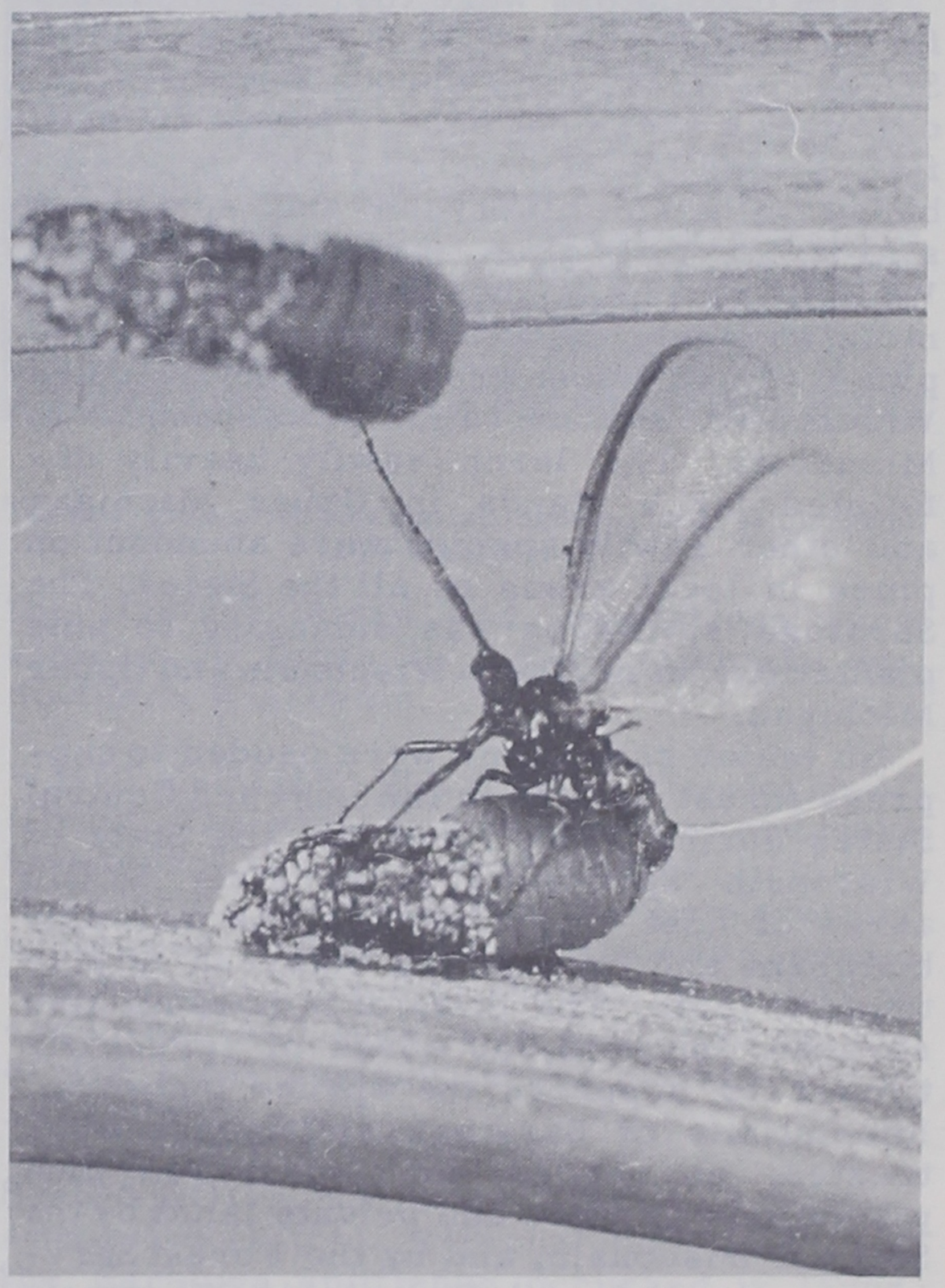
GREAT BASIN TENT CATERPILLAR, *Malacosoma fragile* (Stretch). Aspen on 100,000 acres in northern New Mexico was severely defoliated by this caterpillar. An infestation also increased on the Navajo Indian Reservation, N. Mex., after several years of downward trend.

PINYON NEEDLE SCALE, *Matsucoccus acalyptus* Herbert. Pinyon needle scale infestations continued very heavy at Grand Canyon National Park, Ariz., and at Mesa Verde National Park, Colo. The scale has caused limited tree mortality in these areas. This scale insect assumes great economic importance in recreation areas of the Southwest where pinyon is often the only tree available for shade.

FALL WEBWORM, *Hyphantria cunea* (Drury). The fall webworm is a serious defoliator of cottonwood, willow, and other broad-leaved trees in the Southwest. Damage caused by this insect increased considerably

at Aztec Ruins, Chaco Canyon, and Bandelier National Monuments in New Mexico.

PINE SAWFLY, *Neodiprion* sp. A new infestation of an unidentified pine sawfly in ponderosa pine was found near Magdalena in western New Mexico. Sawfly colonies per tree were usually less than three, and infested trees were scattered. The sawfly infestation in the Zuni Mountains, about 80 miles northwest of Magdalena, persisted on about 1,200 acres. Damage to host trees was moderate.



A wingless female of pinyon needle scale mating as she backs from her second instar case prior to her journey to the base of the tree, a favorite egg laying site.

LAKE AND CENTRAL STATES

by

Division of State and Private Forestry,
Milwaukee, Wisconsin[1]

Conditions in Brief

Tree defoliators were the most important forest insects in the Lake States and Central States in 1961. The spruce budworm increased in scope and severity in the spruce-fir forests of Minnesota. The jack-pine budworm also intensified and spread in stands of jack pine in Upper Michigan, Wisconsin, and Minnesota. A pine tussock moth severely defoliated jack pine and red pine on extensive areas in northwestern Wisconsin, and on smaller acreages in Minnesota. The larch sawfly heavily defoliated larch stands in Upper Michigan and other sawfly species were abundant on pines in local areas in all the States. The Saratoga spittlebug was damaging to pine plantations in northern Wisconsin and Upper Michigan.

No major campaigns were needed to suppress forest insects in the Lake and Central States during 1961. However, the State of Wisconsin sprayed approximately 38,000 acres of host type to control the jack-pine budworm and contain the outbreak of pine tussock moth. The State of Minnesota also sprayed some 13,000 acres of spruce-fir timber to suppress the spruce budworm. Infestations of Saratoga spittlebugs were treated, as needed, to protect red pine plantations on State and private lands by the State of Wisconsin, and by the Forest Service on the National Forests in Wisconsin and Upper Michigan.

Status of Insects

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). Defoliation of spruce-fir timber by the spruce budworm was more severe on a larger area in northern Minnesota than in 1960. Top-killing and tree mortality also increased throughout the 240,000 acres classed as severely defoliated. The area of moderate to heavy defoliation spread east and southeast.

Approximately 13,000 acres of the most damaging infestations in Koochiching County were sprayed by the State of Minnesota to avert wholesale tree-killing. The suppression project was highly successful. Larval populations were reduced by approximately 97 percent.

JACK-PINE BUDWORM, *Choristoneura pinus* Free. The jack-pine budworm defoliated jack pines in varying degree ranging from light to heavy on some 150,000 acres in

Larvae of the spruce budworm and damage caused to balsam fir, Superior National Forest, Minn.

[1] Information on conditions of forest insects in Michigan borrowed from reports by Mr. Paul Flink, Michigan Department of Conservation; that from Wisconsin borrowed from reports by Mr. Donald Renlund, Wisconsin Department of Conservation.

parts of Michigan, Wisconsin, and Minnesota. The most serious infestations, those on approximately 40,000 acres of public and private lands in Wisconsin, were suppressed by aerial spraying. The bulk of the infested acreage was on non-Federal lands and was sprayed by the State of Wisconsin. Population reduction ranging upward from 78 percent was considered satisfactory.

PINE TUSSOCK MOTH, *Dasychira plagiata* (Wlkr.). Sudden and severe infestations of a pine tussock moth in stands of jack pine, red pine, and white spruce occurred at several locations in the Lake States in 1961. The most severe outbreak, one which completely defoliated host trees, extended over some 3,500 acres in the General Andrews State Forest, Minn. The others, on the Chippewa National Forest, Minn., and in parts of Douglas and Bayfield Counties, Wis., were more extensive but less severe. The infestations in Wisconsin totaled some 60,000 acres. It is predicted that heavier infestations in all areas will occur in 1962.

PINE SAWFLIES, *Diprion* and *Neodiprion* spp. There was little damage caused by pine sawflies in the Lake and Central States in 1961. Populations of most species were at such low levels that their occurrences were not reported. The jack-pine sawfly, *N. pratti banksianae* Roh., was noted in light numbers in stands of jack pine infested by the jack-pine budworm on the Chippewa National Forest, Minn. The European pine sawfly, *N. sertifer* (Geoff.), increased slightly in red pine plantations in Lower Michigan. However, a local outbreak of the red-headed pine sawfly, *N. lecontei* (Fitch), in Lower Michigan declined from natural factors, and outbreaks of the introduced species, *D. similis* (Htg.), did likewise in north-central Minnesota and northwestern Wisconsin. The Virginia-pine sawfly, *N. pratti pratti* (Dyar), and *N. lecontei* were reported from a few locations in the Central States.

EUROPEAN PINE SHOOT MOTH, *Rhyacionia buoliana* (Schiff.). A slight increase in populations of the European pine shoot moth occurred in most of the infested red pine plantations in Lower Michigan and southern Wisconsin. There was no spread of infestations, however, and no new infestation discoveries. It is of interest that many of the pine plantations sustaining persistent infestations are outgrowing the effects of post attacks. The European pine shoot moth was reported from widely scattered locations in

Terminal shoot of red pine exposed showing larva of European pine shoot moth.

the Central States and infestations were similar to those in Lower Michigan and southern Wisconsin.

WHITE-PINE WEEVIL, *Pissodes strobi* (Peck). The white-pine weevil was abundant throughout the northern parts of Michigan, Wisconsin, and Minnesota on open-growing white, red, and jack pine and Norway spruce. The damage caused by the weevil is severe each year and thus it is judged to be one of the most serious forest insects in the Lake States.

SARATOGA SPITTLEBUG, *Aphrophora saratogensis* (Fitch). Nymphal populations of the Saratoga spittlebug occurred in large numbers in many red pine plantations in northern Wisconsin and Upper Michigan. Infested plantations on a total of 3,500 acres were sprayed with DDT in late June and early July to avert damage to host trees by the adults. It is anticipated that an additional 3,500 acres of plantations will need to be sprayed for control in 1962.

RED-HUMPED OAKWORM, *Symmerista albifrons* (A. & S.). This insect completely defoliated northern hardwoods on a large, aggregate acreage in Upper Michigan and northern Wisconsin. The outbreaks occurred

in small, well-defined areas on a total of some 12,000 acres. Larval feeding was during late summer and early fall, thus it is likely that defoliated trees were not seriously damaged.

WALKINGSTICK, *Diapheromera femorata* (Say). This walkingstick was abundant on oaks at several locations in Wisconsin. The most extensive outbreak, one which stripped foliage on trees attacked, occurred on 30,000 acres in Marinette County. Other infestations of lesser severity and on smaller acreages were reported from Marathon, Menominee, Oconto, and Eau Claire Counties.

OTHER INSECTS. Larch stands in Upper Michigan were severely defoliated by the larch sawfly, *Pristiphora erichsonii* (Hartig). Light infestations of the Nantucket pine tip moth, *Rhyacionia frustrana* (Comst.), were reported from Illinois and Missouri. The black turpentine beetle, *Dendroctonus terebrans* (Oliv.), occurred in small numbers at isolated locations in Missouri.

SOUTHERN STATES

by

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Conditions in Brief

Bark beetles and defoliators continued to be the principal insects affecting forest stands in the Southern States. The southern pine beetle ravaged pine stands in the Big Thicket area of southeastern Texas and reached epidemic levels in parts of Alabama, Mississippi, South Carolina, and Georgia. The black turpentine beetle increased in pine stands on lowlands where logging was done by heavy equipment under wet conditions. The elm spanworm caused severe defoliation of hardwoods in western North Carolina, east Tennessee, and north Georgia. Isolated infestations of the balsam woolly aphid were found on Frazer fir in North Carolina to the north and east of the original Mt. Mitchell infestation. The forest tent caterpillar severely defoliated 1½ million acres of bottom-land hardwood forests in Louisiana. An additional one million acres were lightly to moderately defoliated.

Status of Insects

SOUTHERN PINE BEETLE, *Dendroctonus frontalis* Zimm. The southern pine beetle epidemic in southeastern Texas continued in 1961, and no relief is indicated for 1962. As of November 1961, 961 spot infestations had been mapped by aerial observers in Liberty, Harden, Tyler, and Polk Counties. The spot infestations ranged from about one-quarter acre to 640 acres in size, the larger ones consisting of several thousand infested trees. Early summer rains hampered control crews, and an estimated 80,000 infested trees occurred in outbreak areas at year end.

There were new outbreaks of serious proportions on the Homochitto National Forest, southeast Mississippi, and a two to tenfold increase in number of trees killed occurred on the Talladega National Forest,

Group-killing of loblolly pine by southern pine beetle. Hardin County, Tex.

Ala. The infestations increased rapidly on the Homochitto Forest from July to October and those on the Talladega Forest increased despite prompt and concerted efforts to suppress them. Infestations continued at epidemic levels on the General Pickens Ranger District, Sumter National Forest, S. C., and adjacent private lands. In that area, tree-killing was severe on a gross area of approximately 100,000 acres. In Georgia, there were outbreaks at scattered

[1] Information compiled from reports submitted by W. D. Buchanan, Dale VanDenburg, and David Ketcham.

Typical gallery pattern of southern pine beetle on inner bark surface of loblolly pine.

locations on four of the Ranger Districts on the Chattahoochee National Forest.

The major effort to suppress the southern pine beetle has been by salvaging infested trees. On areas where salvage was not possible, infested trees were felled and sprayed with toxic chemicals. Federal, State, and private agencies participated in the suppression campaigns.

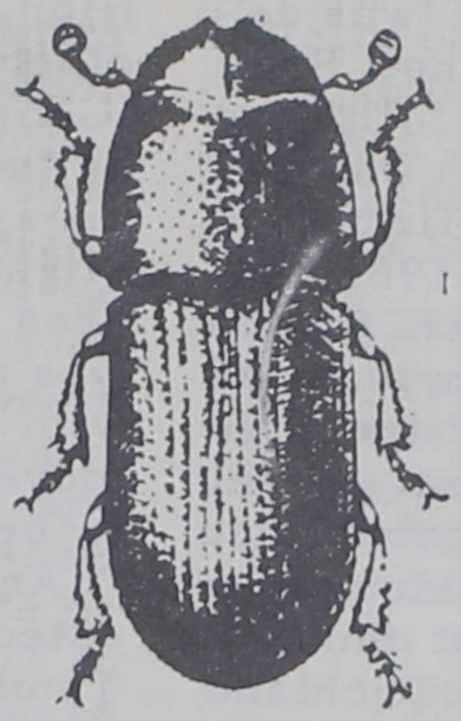
BLACK TURPENTINE BEETLE, *Dendroctonus terebrans* (Oliv.). The black turpentine beetle continued its activity on National Forest and private land following logging and other operations. Populations were generally lower this year than in the past 2 years, primarily because of a general decrease in logging activity, favorable moisture, and widespread control operations.

In low areas, particularly in the Gulf States, which were logged by heavy equipment under wet conditions, heavier losses occurred. Populations were extremely high in low areas where pine poles, sawtimber, and pulpwood and hardwood were removed in four successive operations. Beetle activity also increased in naval stores areas in southern Alabama and southern Georgia, especially where trees were tapped for the first time.

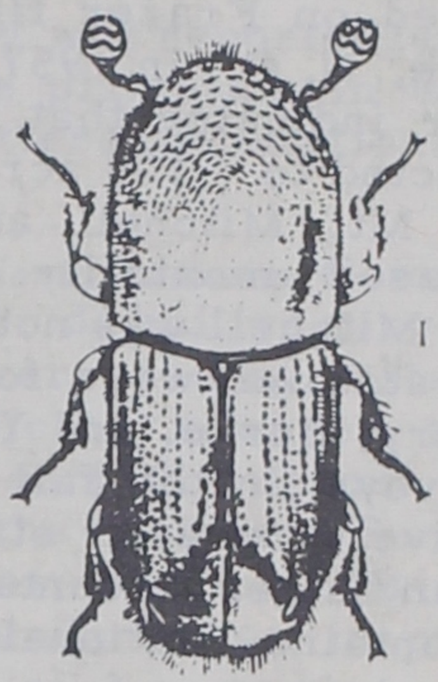
IPS (PINE ENGRAVERS), *Ips* spp. During the spring, a series of tornados and windstorms blew down several million board feet of shortleaf pine timber in western Arkansas. Rapid salvage and weather conditions unfavorable for brood development prevented what could have been a serious ips outbreak. Ips beetles did increase as a result of this damage, but not sufficiently to cause alarm.

Infestations of ips in other parts of the Southern and Southeastern States were generally limited to trees struck by lightning, damaged by salt water in the overflow from oil wells, or otherwise weakened. *Ips avulsus* Eichh. was often found associated with the southern pine beetle in southeast Texas and Alabama, making it difficult at times to determine which was the primary tree-killer. There has also been some indication of increase in ips activity in southern Florida in trees weakened by 1959-60 hurricanes.

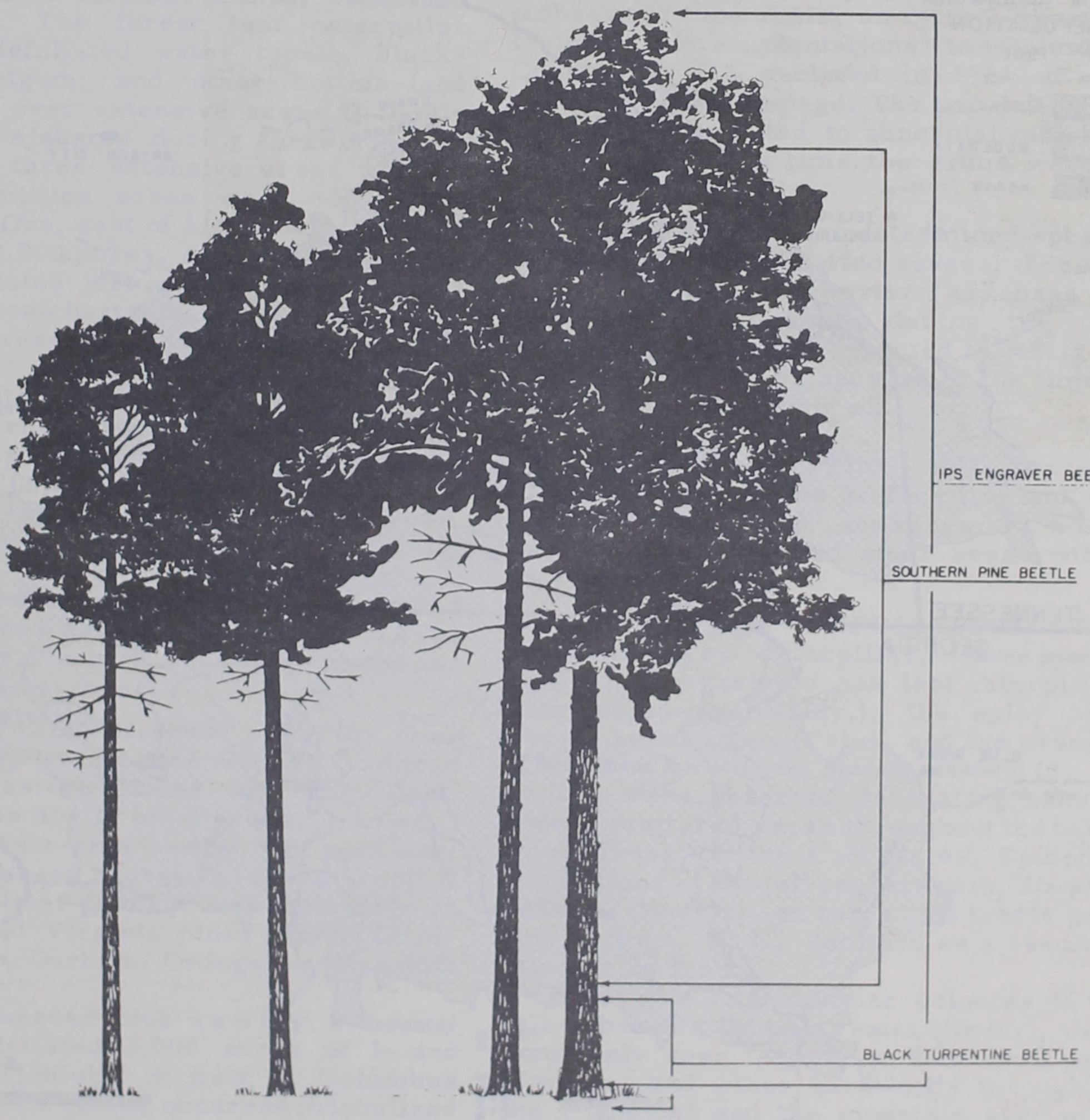
BLACK TURPENTINE BEETLE



SOUTHERN PINE BEETLE



IPS ENGRAVER BEETLES

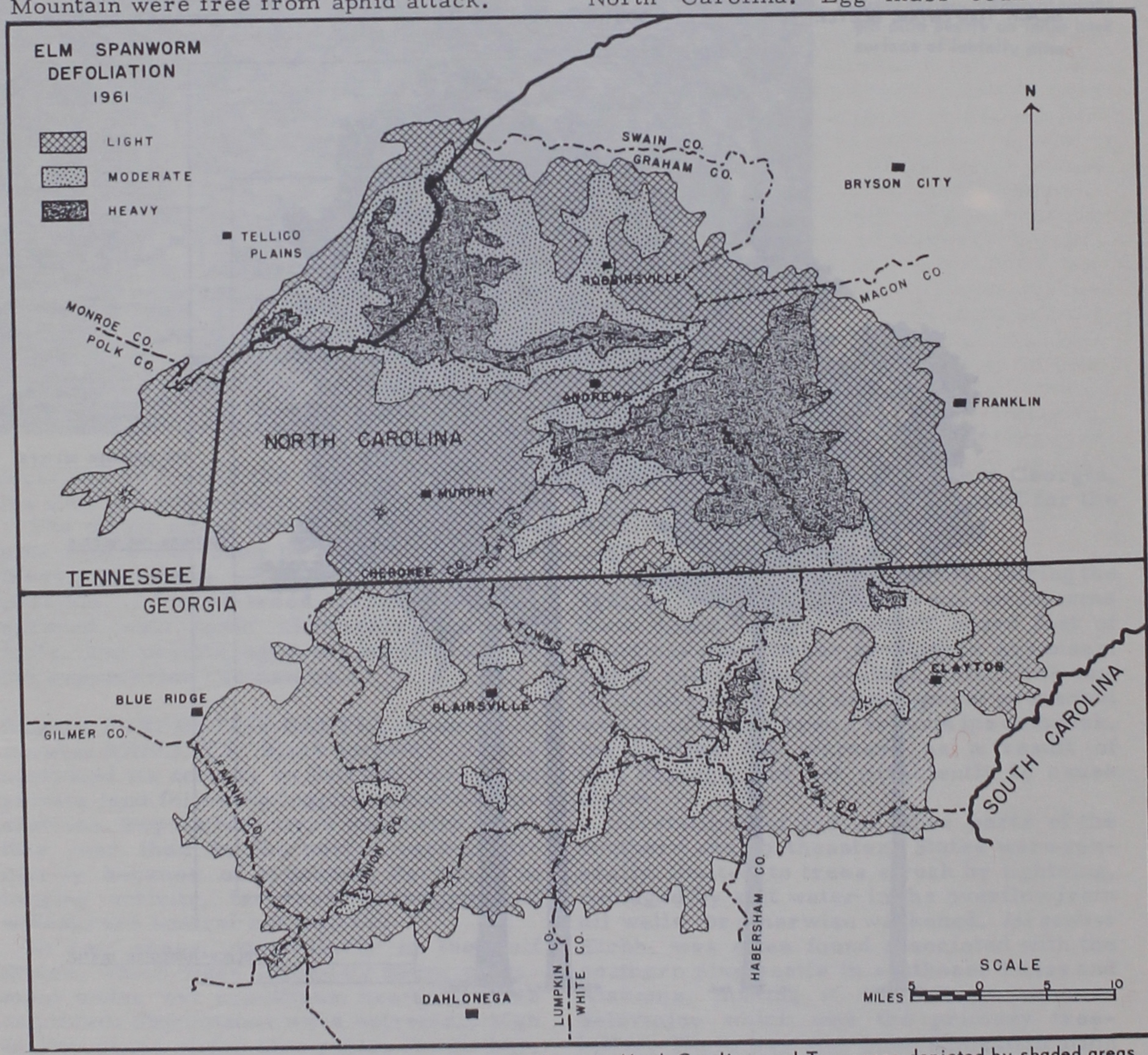


Common bark beetles in the Southern and Southeastern States.

BALSAM WOOLLY APHID, *Chermes piceae* (Ratz.). The balsam woolly aphid was detected on Frazer fir on Mt. Mitchell State Park, N. C., in 1957. Surveys the following year indicated that the infestation was restricted to 7,100 acres of spruce-fir type in the Mt. Mitchell area. During 1961, increased mortality of the Frazer fir on Mt. Mitchell was noted. In addition, isolated infestations were found on shade trees in Avery, Burke, and Yancey Counties. Aerial surveys in the fall of 1961 indicated that native spruce-fir stands on Roan Mountain, Grandfather Mountain, the Great Smokey Mountains National Park, and Richland Mountain were free from aphid attack.

ELM SPANWORM, *Ennomos subsignarius* (Hbn.). Defoliation of oaks, hickories, and other hardwoods in the tri-State area (Georgia, Tennessee, and North Carolina) by the elm spanworm encompassed a gross area of 1,532,000 acres in 1961. This was a slight decrease from last year's gross area of 1,676,000 acres. However, there was a considerable increase in the acreage with moderate and heavy defoliation. The movement of the outbreak in 1961 continued to be in a northerly and easterly direction.

An egg mass survey in September indicated a population decline over most of Tennessee, Georgia, and southwestern North Carolina. Egg mass counts were



Extent and degree of elm spanworm defoliation in Georgia, North Carolina, and Tennessee depicted by shaded areas on map.

high, however, in Macon and Graham Counties, N. C., and Rabun and Habersham Counties, Ga. Moderate to heavy defoliation can be expected in these counties in 1962.

Elm spanworm infestations were suppressed on a total of 7,850 acres of high-value recreational and research areas on the Chattahoochee National Forest, Joyce Kilmer Memorial Forest, and the Coweeta Hydrologic Laboratory in Macon County, N. C. Suppression was by helicopter application of DDT at the rate of one-half pound DDT to one gallon of oil per acre or by fixed-wing aircraft at one pound DDT in one gallon of oil per acre. Both ratios were equally effective in control.

FOREST TENT CATERPILLAR, *Malacosoma disstria* Hbn. The forest tent caterpillar severely defoliated water tupelo, blackgum, sweetgum, and other bottom-land hardwoods over extensive areas in Louisiana and Alabama during the spring. In Louisiana, three extensive areas totaling about $1\frac{1}{2}$ million acres were completely defoliated. One, east of Alexandria, covered at least 300,000 acres. About 250,000 acres were defoliated just west of New Orleans and Lake Pontchartrain, and over one million acres were defoliated in the Atchafalaya Basin. Most of the latter two areas were also defoliated in 1960.

In southern Alabama, along the Alabama River, complete defoliation occurred on an estimated 200,000 acres. This was an increase of 144,000 acres over last year. An additional 450,000 acres were lightly defoliated.

Severe defoliation is expected to occur in all infested areas in both States in 1962 unless natural factors, such as parasites and predators, intervene.

PINE SAWFLIES, *Neodiprion* spp. Pine sawflies were generally endemic in all Southern and Southeastern States with only light, scattered feeding in most areas.

The Virginia-pine sawfly, *N. pratti pratti* (Dyar), continued to decline in north-central North Carolina. Damage was noticeable on shortleaf and Virginia pines only in Granville, Vance, Durham, Orange, and Franklin Counties.

The red-headed pine sawfly, *N. lecontei* (Fitch), defoliated 2,000 acres of 3- and 4-year-old loblolly pines in Columbus County, N. C. Feeding occurred in localized spots. In some cases, individual trees were stripped of their foliage.

In Arkansas, the loblolly-pine sawfly, *N. taedae linearis* (Ross), defoliated approximately 50 acres of thinly stocked stands of loblolly pine.

An unidentified sawfly was reported feeding on a 500-acre pine plantation in west Tennessee, and in scattered plantations in the Gulf States.

PINE TIP MOTHS, *Rhyacionia frustrana* (Comst.) and *R. rigidana* (Fern.). No definitive surveys were made of these ever-present pests of young pine. Reports indicate, however, that both species were present throughout the pine growing areas of the South and Southeast. In most instances, the populations were reported less abundant than in previous years.

PINE CHAFER, *Anomala oblivia* Horn. An outbreak of pine chafer on 2- or 3-year-old loblolly pine plantations in Columbus County, N. C., declined in 1961 after 3 years of heavy damage. The population decline was attributed to abnormal moisture conditions at the time the grubs were in the soil.

WALKINGSTICK. An undetermined species of walkingstick defoliated several thousand acres of oak in southwestern Arkansas and southeastern Oklahoma during the fall. Very little damage is expected to host trees from the infestation because of the time of year defoliation occurred.

TEXAS LEAF-CUTTING ANT, *Atta texana* (Buckley). The Texas leaf-cutting ant defoliated young pine seedlings in west-central Louisiana and other areas within its range.

MISCELLANEOUS DEFOLIATORS. The yellow-necked caterpillar, *Datana ministra* (Drury), the variable oak leaf caterpillar, *Heterocampa manteo* (Dbldy.), the spiny oakworm, *Anisota stigma* (Fab.), and the orange-striped oakworm, *Anisota senatoria* (J. E. Smith), were observed defoliating oaks in widely scattered areas throughout the hardwood areas of the Gulf States. Epidemic populations of the fall canker worm, *Alsophila pometaria* (Harris), on two small tracts near Hot Springs, N. C., declined as a result of late spring frost.

During the late summer colonies of the fall webworm, *Hyphantria cunea* (Drury), were commonly seen feeding on sourwood, persimmon, and other hardwoods throughout the Piedmont and the mountain section of North Carolina. In some localities, individual trees were stripped of their foliage, but nowhere were extensive areas completely defoliated.

NORTHEASTERN STATES

by

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Conditions in Brief

There was considerable defoliation of hardwoods by gypsy moth in New England and New York. In Maryland, Virginia, and North Carolina, defoliation of pine by the Virginia-pine sawfly continued, but at a reduced rate. The white-pine weevil destroyed a large proportion of the 1961 white pine terminal growth throughout the Northeast. From Maine to Virginia and westward many species of sawflies defoliated many small areas of pines; some were only slightly infested, while others suffered tree mortality. Hardwoods were defoliated extensively by the fall webworm along roadsides and elsewhere throughout the Northeastern States. Suppression on extensive areas was carried out against spruce budworm, white-pine weevil, and gypsy moth. Some promising new developments in forest insect control were tested.

Status of Insects

SPRUCE BUDWORM, *Choristoneura fumiferana* (Clem.). Significant infestations of the spruce budworm remained confined to northern Maine where damaging populations have been suppressed annually since 1954 to prevent catastrophic outbreaks. Suppression in 1961 involved spraying on 53,000 acres of balsam fir in northern Aroostook County and postsuppression evaluation revealed a 98 percent reduction in budworm populations. State fish and game biologists found no serious damage to wildlife in the sprayed area.

Spruce budworm surveys in 1961 showed that poor spring weather had not adversely affected budworm larvae, parasitism remained discouragingly low, and egg masses were numerous enough to cause heavy defoliation on about 80,000 acres in 1962. Following evaluation of damage to host trees in the infestation area, Maine forestry officials made a decision against suppression in 1962.

VIRGINIA-PINE SAWFLY, *Neodiprion pratti pratti* (Dyar). An outbreak of the Virginia-pine sawfly has occurred on Virginia, pitch, and shortleaf pines on extensive areas in Maryland, Virginia, and parts of North Carolina for the past several years. The infestation persisted throughout the tri-State area in 1961 but was less severe than last year. Cool, wet weather adversely affected the larvae and the trend of the outbreaks is downward.

RED-HEADED PINE SAWFLY, *Neodiprion lecontei* (Fitch). Scattered infestations of the red-headed pine sawfly were damaging to red and Scotch pines, notably in plantations, from New York southward to Virginia, West Virginia, and Kentucky. Damage ranged from light to very heavy, with killing of small groups of trees in some places. The large number of small outbreaks of this and other sawfly species over a wide geographical area in the Northeastern States points to the need for early detection and prompt suppression to prevent damage and loss to affected stands.

WHITE-PINE WEEVIL, *Pissodes strobi* (Peck). This perennial forest pest continued to inflict serious damage to white pine, Norway spruce, and other conifers in the Northeastern States. As usual, damage to host trees was most severe in plantations and other similar open-growing sites.

Effective and economical control of the white-pine weevil has been difficult to attain. However, the leader drench method of spraying is proving effective and economical and is strongly recommended. Suppression by spraying from aircraft and mistblowers has not proved consistently successful. However, further tests of spraying from the air and on the ground are

planned in efforts to develop suitable means for controlling infestations on trees too tall to permit individual leader drench treatment.

RED-PINE SCALE, *Matsucoccus resinosae* B. & G. This serious pest of red pine in the Bridgeport, Conn. area, and on Long Island and in Westchester County, N. Y., was found on a 160-acre watershed planting around the Wanague Reservoir, N. J., in 1960. New Jersey officials took vigorous steps in 1961 to eliminate the scale from the watershed planting and adjacent small areas--the only known infestations in the State--by destroying all host trees. New York and Connecticut also expanded detection programs and are destroying infested host trees to reduce scale spread. An effective method for control of the scale, short of elimination of host trees, is not known.

EUROPEAN PINE SHOOT MOTH, *Rhyacionia buoliana* (Schiff.). The European pine shoot moth has long caused serious damage to red pine in parts of Connecticut, New Jersey, and Pennsylvania, enough so as to discourage landowners from further planting that species of tree. Infestations in other of the Northeastern States caused damage of varying degree. The insect appears to be increasing in extent each year.

PINE LEAF APHID, *Pineus pinifoliae* (Fitch). The heaviest infestations of the pine leaf aphid occurred in Maine and New Hampshire. Spot infestations also occurred in New York and Vermont. The accumulation of galls on red spruce was heavy in all infested areas. Aphid damage to white pines in eastern Maine, an area supporting a long-term heavy infestation, amounted to as much as 29 percent of understory trees more than 3 feet tall in mixed stands. Tree mortality in mixed stands was fifteen times greater than in open stands.

Tests to suppress the aphid with DDT, Sevin, and malathion, using ground equipment to simulate aerial application, failed to prevent aphid establishment on white pine.

BALSAM WOOLLY APHID, *Chermes piceae* (Ratz.). The balsam woolly aphid is generally distributed throughout stands of balsam fir in Maine, New Hampshire, Vermont, and parts of New York. It is a serious pest in all areas, gouting and killing affected trees.

The successful establishment of the predaceous beetle, *Laricobius erichsonii* Rosenh., in aphid infested stands in eastern Canada and parts of Maine, prompted increased efforts in 1961 to effect biological control of the aphid in several New England locations. Colonies of 500 or more of the beetles, imported from Germany, were released on heavily infested firs at several places in Maine, Vermont, and New Hampshire. In all, approximately 20,000 beetles were released at 20 separate locations.

GYPSY MOTH, *Porthetria dispar* (L.). The gypsy moth was reported to have developed to major epidemic status in parts of New England and New York. State and Federal agencies cooperated in programs to suppress outbreak populations and prevent spread by spraying approximately 165,000 acres. Trapping outside the generally infested area resulted in catches of male moths in parts of New Jersey, Pennsylvania, New York, Vermont, New Hampshire, and Maine, indicating incipient infestations in those areas.

Results from recent research point to hopeful new techniques for control and eradication of the gypsy moth. The newly synthesized sex attractant offers interesting possibilities and recent tests with *Bacillus thuringiensis* show considerable promise. Chemosterilants and radioactive sterilization of male moths also offer some promising leads.

BEECH SCALE, *Cryptococcus fagi* (Baer.). The killing of beech by the beech scale *Nectria* fungus complex continued in northern New England and New York. Scale populations increased in the more recently infested stands and there was spread to new areas. *Nectria* commonly follows in the wake of beech scale infestations to complete the tree-killing process.

Another scale insect on beech, *Xylococculus betulae* (Perg.), was common on the eastern slopes of the White Mountains, New Hampshire.

FOREST TENT CATERPILLAR, *Malacosoma disstria* Hbn. Moderate defoliation of hardwoods by the forest tent caterpillar occurred at many locations in the Northeastern States. With the exception of an increasing infestation in western Massachusetts, populations declined from levels that occurred in 1960.

LINDEN LOOPER, *Erannis tiliaria* (Harris). This insect represents one of a group of

problematical pests that may be referred to as "miscellaneous hardwood defoliators." When defoliation is noted, a complex of species is usually involved, with one or two predominating. Outbreaks are generally characterized by sudden population increase and rapid decline, with several years elapsing in an area before the same or a different complex causes heavy defoliation again. Because the linden looper is expected to be in major outbreak status on over 40,000 acres in Connecticut in 1962, it is singled out for reporting here.

In Connecticut in 1961 approximately 1,500 acres were sprayed to suppress a complex of about four species, predominantly cankerworms. Noticeable defoliation was seen on 37,500 acres located west of the Connecticut River. A fall flight of male moths in the area indicates that the linden looper will reach epidemic status on a much larger acreage. At the same time the cankerworms in the species complex may prove less severe.

FALL WEBWORM, *Hyphantria cunea* (Drury). High populations of this insect on roadside trees from Maine to Virginia and westward led to many reports of its unusual abundance in 1961. The esthetic value of affected trees in many locations likely will lead to some suppression effort in 1962. Natural factors are expected to exert a controlling influence on webworm populations in the near future and outbreaks are not expected to continue beyond 1963.

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